Ancient and Medieval Gardens

Prepared by Robert G. Bedrosian

Wikipedia articles:

History of Gardening
Gardens of Ancient Egypt
Hanging Gardens of Babylon

Greek Gardens
Roman Gardens

Gardens of Sallust
Gardens of Lucullus

Vatican Gardens

Persian Gardens
Mughal Gardens

Chinese Garden
Classical Gardens of Suzhou

***Encyclopaedia Iranica* articles:**

Achaemenid Gardens, by Mehrdad Fakour.
Gardens in the Islamic Period, by Lisa Golombek.
The Influence of Persian Gardens in India, by Howard Crane.
Čahārbāḡ, by David Stronach.

Sites and Studies:

Persian Gardens, Chahar Bagh, Pairidaeza, Baghs, by K. E. Eduljee, at heritageinstitute.com.

[Middle East Garden Traditions](), at Dumbarton Oaks. Includes al-Andalus, Mughal, Ottoman, Persian, and Syrian.

Byzantine Gardens, at Google Images.
Byzantine Garden Culture, at Dumbarton Oaks.

Landscape Design and the Experience of Motion, at Dumbarton Oaks.

History of Gardens in East Asia: Online Resources, at Bard University.

Geoponica. This unusual and undervalued work was prepared for the mid-10th century Byzantine emperor Constantine VII Porphyrogenitus. *Geoponica/Geoponika* is a compilation on agricultural topics based on the writings of earlier authors, some extending back to Roman and Hellenistic times. In addition to discussions of gardening, there are entries on medicinal wines, thunder divination (brontoscopy), and other remarkable topics. The work became widely known in the Aegean and Middle East during the 10-13th centuries through translations from the Greek original into Syriac, Pahlavi, Arabic, and Armenian (Գիրք վաստակոց *Girk' vastakots' [Book of Labors]*).

Geoponika: Agricultural Pursuits, translated from Greek by Thomas Owen in two volumes: volume 1 (London, 1805), in 347 searchable pdf pages; volume 2, (London, 1806) in 345 searchable pdf pages.

Kepopoiïa: Garden Making and Garden Culture in the Geoponika, by Robert Rodgers, from *Byzantine Garden Culture* (Washington, D.C., 2002), pp. 160-175, in 18 pdf pages. Dumbarton Oaks publication.

The Folklore of the Geoponica, by H. J. Rose, from *Folklore*, Vol. 44, No. 1 (Mar., 1933), pp. 57-90, in 35 pdf pages.

Gardens Ancient and Modern (London, 1899), by Albert Forbes Sieveking, in 464 pdf pages.

An Encyclopaedia of Gardening (London, 1871), by J. C. Loudon. Part I of the book contains a general history of gardens and gardening in some western and eastern countries, in 400 pdf pages.

The Famous Parks and Gardens of the World (London, 1880), described and illustrated, no author, T. Nelson and Sons publishers, in 230 pdf pages. Mostly ancient and medieval periods.

Ancient

Ancient Egyptian Gardens, by Jane M. H. Bigelow, from *Ostracon*, vol. 2, 1(2000) in 6 pdf pages.

Symbolism and Design in Ancient Egyptian Gardens, by Alix Wilkinson, from *Garden History*, Vol. 22, No. 1 (Summer, 1994), pp. 1-17, in 18 pdf pages.

On Royal Gardens in Mesopotamia, by A. Leo Oppenheim, from *Journal of Near Eastern Studies*, Vol. 24, No. 4, Erich F. Schmidt Memorial Issue. Part Two (Oct., 1965), pp. 328-333, in 7 pdf pages.

Grapevines in Ashurbanipal's Garden, by Pauline Albenda, from *Bulletin of the American Schools of Oriental Research*, No. 215 (Oct., 1974), pp. 5-17, in 14 pdf pages.

On the Origins of Kitchen Gardening in the Ancient Near East, by Helen M. Leach, from *Garden History*, Vol. 10, No. 1 (Spring, 1982), pp. 1-16, in 17 pdf pages.

The Story of Spices, by John W. Parry, from *Economic Botany*, Vol. 9, No. 2 (Apr. - Jun., 1955), pp. 190-207, in 19 pdf pages.

The Economic Plants of the Bible, by Harold N. Moldenke, from *Economic Botany*, Vol. 8, No. 2 (Apr. - Jun., 1954), pp. 152-163, in 13 pdf pages.

Noms grecs de plantes d'origine pré-hellénique, by Albert Carnoy, from *L'Antiquité Classique*, T. 27, Fasc. 2 (1958), pp. 305-327, in 24 pdf pages.

The Aegean Garden, by Maria C. Shaw, from *American Journal of Archaeology*, Vol. 97, No. 4 (Oct., 1993), pp. 661-685, in 26 pdf pages.

Imported Exotica: Approaches to the Study of the Ancient Plant Trade, by Elizabeth Macaulay-Lewis, from *Bolletino di Archeologia on line* (Rome, 2008), XVII International Congress of Classical Archaeology, Roma 22-26 Sept. 2008, pp. 16-26, in 11 pdf pages.

Shipwrecked Plant Remains, by Cheryl Ward Haldane, from *Biblical Archaeologist*, Vol. 53, No. 1, An Underwater View of the Ancient World (Mar., 1990), pp. 55-60, in 7 pdf pages.

Gardens at a Crossroads: The Influence of Persian and Egyptian Gardens on the Hellenistic Royal Gardens of Judea, by Rona-Shani Evyasaf, from *Bolletino di Archeologia on line* (Rome, 2008), XVII International Congress of Classical Archaeology, Roma 22-26 Sept. 2008, pp. 27-37, in 11 pdf pages.

Parks and Gardens of the Ancient Empires, by Dorothy Burr Thompson, from *Archaeology*, Vol. 3, No. 2 (June, 1950), pp. 101-106, in 7 pdf pages.

Ancient Gardens in Greece and Italy, by Dorothy Burr Thompson, from *Archaeology*, Vol. 4, No. 1 (March, 1951), pp. 41-47, in 8 pdf pages.

The Garden of Hephaistos, by Dorothy Burr Thompson, from *Hesperia: The Journal of the American School of Classical Studies at Athens*, Vol. 6, No. 3, *The American Excavations in the Athenian Agora: Twelfth Report* (1937), pp. 396-425, in 31 pdf pages.

Ancient Mediterranean Pleasure Gardens, by Ellen Churchill Semple, from *Geographical Review*, Vol. 19, No. 3 (Jul., 1929), pp. 420-443, in 25 pdf pages.

See also another page: Selected Writings of Ellen Churchill Semple.

The Flowerpots from Herod's Winter Garden at Jericho, by Joseph Yellin and Jan Gunneweg, from *Israel Exploration Journal*, Vol. 39, No. 1/2 (1989), pp. 85-90, in 8 pdf pages.

Delight and Danger in the Roman Water Garden: Sperlonga and Tivoli, by Ann Kuttner, from *Landscape Design and the Experience of Motion*, edited by Michel Conan, *Dumbarton Oaks Colloquium on the History of Landscape Architecture*, vol. 24 (Washington, D.C., 2003) in 55 pdf pages. Sperlonga dates from c. 30 B.C.; Tivoli, from c. 130 A.D.

Gardens of the Roman World, by Patrick Bowe, in 178 lavishly illustrated pdf pages. Publication of the J. Paul Getty Museum (Los Angeles, 2004).

Medieval

The Late Antique and Early Medieval Gardens of the East, by James Schryver, from *Bolletino di Archeologia on line* (Rome, 2008), XVII International Congress of Classical Archaeology, Roma 22-26 Sept. 2008, pp. 3-7, in 5 pdf pages.

The Hispano-Arab Garden: Its Philosophy and Function, by James Dickie, from *Bulletin of the School of Oriental and African Studies*, Vol. 31, No. 2 (1968), pp. 237-248, in 13 pdf pages.

The Mirador in Abbasid and Hispano-Umayyad Garden Typology, by D. Fairchild Ruggles, from *Muqarnas*, Vol. 7 (1990), pp. 73-82, in 11 pdf pages.

Spanish Gardens in Their Historical Background, by John H. Harvey, from *Garden History*, Vol. 3, No. 1 (Autumn, 1974), pp. 7-14, in 9 pdf pages.

Gardening Books and Plant Lists of Moorish Spain, by John H. Harvey, from *Garden History*, Vol. 3, No. 2 (Spring, 1975), pp. 10-21, in 13 pdf pages.

Garden Plants of Moorish Spain: A Fresh Look, by John H. Harvey, from *Garden History*, Vol. 20, No. 1 (Spring, 1992), pp. 71-82, in 13 pdf pages.

Economic Botany and Ethnobotany in Al-Andalus (Iberian Peninsula: Tenth-Fifteenth Centuries), an Unknown Heritage of Mankind, by J. Esteban Hernández Bermejo and Expiración García Sánchez, from *Economic Botany*, Vol. 52, No. 1 (Jan. - Mar., 1998), pp. 15-26, in 13 pdf pages.

The Study of Byzantine Gardens: Some Questions and Observations from a Garden Historian, by Joachim Wolschke-Bulmahn, from *Byzantine Garden Culture* (Washington, D.C., 2002), pp. 1-12, in 12 pdf pages. Dumbarton Oaks publication.

Byzantine Monastic Horticulture: The Textual Evidence, by Alice-Mary Talbot, from *Byzantine Garden Culture* (Washington, D.C., 2002), pp. 37-67, in 32 pdf pages. Dumbarton Oaks publication.

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The Mughal Garden: Gateway to Paradise, by James Dickie, from *Muqarnas*, Vol. 3 (1985), pp. 128-137, in 11 pdf pages.

Fragrance/Perfume/Incense

Cosmetics, Perfumes and Incense in Ancient Egypt, by A. Lucas, from *Journal of Egyptian Archaeology*, Vol. 16, No. 1/2 (May, 1930), pp. 41-53, in 14 pdf pages.

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The Book of Perfumes (London, 1865), by Eugene Rimmel, in 348 searchable pdf pages.

Sweet-Scented Flowers and Fragrant Leaves (London, 1895), with notes on their history and utility by Donald McDonald, in 235 pdf pages.

History and Utilization of *Rosa damascena*, by Mark P. Widrlechner, from *Economic Botany*, Vol. 35, No. 1 (Jan. - Mar., 1981), pp. 42-58, in 18 pdf pages.

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> Ayurvedic Texts, at Wikipedia.
> Ayurvedic Medicaments, at Wikipedia.

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Spices, at Wikipedia.

Medicinal Plants, at Wikipedia.

Medicinal Herb Garden, at the University of Washington.

Medicinal Mushrooms/Fungi, at Wikipedia, especially:

> Cordyceps sinensis, Cordyceps
> Ganoderma lucidum, Reishi/Ling zhi
> Grifola frondosa, Maitake, Hen of the Woods
> Hericium erinaceus, Yamabushitake, Lion's Mane
> Inonotus obliquus, Chaga/чага
> Lentinula edodes, Shitake
> Trametes versicolor, Yun zhi, Turkey Tail

Rhodiola rosea, Golden Root/Золотой Корень, at Wikipedia.

Flora of Syria, Palestine, and Sinai, by George E. Post (Beirut, 1896).

Identification of Biblical Hyssop and Origin of the Traditional Use of Oregano-Group Herbs in the Mediterranean Region, by Alexander Fleisher and Zhenia Fleisher, from *Economic Botany*, Vol. 42, No. 2 (Apr. - Jun., 1988), pp. 232-241, in 11 pdf pages.

Sage as a Condiment in the Graeco-Roman Era, by Alfred C. Andrews, from *Economic Botany*, Vol. 10, No. 3 (Jul. - Sep., 1956), pp. 263-266, in 5 pdf pages.

Ancient Egyptian Herbal Wines, by Patrick E. McGovern, Armen Mirzoian, Gretchen R. Hall and Ofer Bar-Yosef, from *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 106, No. 18 (May 5, 2009), pp. 7361-7366, in 7 pdf pages.

Man and Plants against Pain, by Norman Grover, from *Economic Botany*, Vol. 19, No. 2 (Apr. - Jun., 1965), pp. 99-112, in 15 pdf pages.

The History of the Poppy and of Opium and Their Expansion in Antiquity in the Eastern Mediterranean Area, by P. G. Kritikos and S. P. Papadaki, in 59 searchable pdf pages. Translated from Greek by George Michalopoulos. This excellent well-documented study appeared in two parts in *Bulletin of Narcotics* 19(3) 1967 pp. 17-38, and 19(4) 1967 pp. 5-10. It examines Classical texts and archaeological discoveries for evidence of the poppy in Greece, Crete, Cyprus, Mycenaean civilization, Macedonia, the Aegean Islands, Asia Minor and Eastern Thrace, Egypt, Sumeria, Babylonia, Assyria, Persia, among the Hebrews, and in India. Other topics include: the poppy as an emblem on coins; etymology and popular nomenclatures; methods of extracting and taking opium; the drug nepenthes mentioned by Homer; and the symbolic meaning of the poppy.

The Botanical Aspects of Ancient Egyptian Embalming and Burial, by Bill B. Baumann, from *Economic Botany*, Vol. 14, No. 1 (Jan. - Mar., 1960), pp. 84-104, in 22 pdf pages.

Ancient Herbs in the J. Paul Getty Museum Gardens, by Jeanne D'Andrea, illustrations by Martha Breen Bredemeyer (Malibu, California, 1989), in 99 pdf pages.

Asaph Goor

Five Fruits of the Holy Land, by Asaph Goor, in 95 searchable pdf pages. The five articles in this download were published in *Economic Botany* during the years 1965-1967.

Contents:

The History of the Fig in the Holy Land from Ancient Times to the Present Day, from *Economic Botany*, Vol. 19, No. 2 (Apr. - Jun., 1965), pp. 124-135, in 13 pdf pages.

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John Scarborough

Theophrastus on Herbals and Herbal Remedies, from *Journal of the History of Biology*, Vol. 11, No. 2 (Autumn, 1978), pp. 353-385, in 34 pdf pages.

The Drug Lore of Asclepiades of Bithynia, from *Pharmacy in History*, Vol. 17, No. 2 (1975), pp. 43-57, in 16 pdf pages.

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Herbs of the Field and Herbs of the Garden in Byzantine Medicinal Pharmacy, from *Byzantine Garden Culture* (Washington, D.C., 2002), pp. 177-188, in 13 pdf pages. Dumbarton Oaks publication.

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Pseudo-Dioscorides' "Ex Herbis Femininis" and Early Medieval Medical Botany, by John M. Riddle, from *Journal of the History of Biology*, Vol. 14, No. 1 (Spring, 1981), pp. 43-81, in 40 pdf pages. This is a 5th-6th century medieval treatise based on *De Materia Medica* by Pedanius Dioscorides (c. 40-90 A.D.), but superior to it and more popular. Includes illustrations and a table of herbs.

From Galen to Alexander, Aspects of Medicine and Medical Practice in Late Antiquity, by Vivian Nutton, from *Dumbarton Oaks Papers*, Vol. 38, *Symposium on Byzantine Medicine* (1984), pp. 1-14, in 15 pdf pages. Covers from the 2nd century Galen through Alexander of Tralles in the 6th century.

Isidore of Seville: The Medical Writings. An English Translation with an Introduction and Commentary, by William D. Sharpe, from *Transactions of the American Philosophical Society*, New Series, Vol. 54, No. 2 (1964), pp. 1-75, in 75 pdf pages. Bishop Isidore of Seville lived c. 560-635.

Medical Books in the Byzantine World, edited by Barbara Zipser (Bologna, 2013), in 194 pdf pages. Fascinating articles by authors including Nutton, Horden, Stathakopoulos, Fischer, Petit, Bennett, Serikoff, Bhayro, Markowetz, and Zipser.

Aspects of Byzantine Materia Medica, by Jerry Stannard, from *Dumbarton Oaks Papers*, Vol. 38, *Symposium on Byzantine Medicine* (1984), pp. 205-211, in 8 pdf pages.

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Medicines and Spices, with Special Reference to Medieval Monastic Accounts, by Marjorie Jenkins, from *Garden History*, Vol. 4, No. 3 (Autumn, 1976), pp. 47-49, in 4 pdf pages.

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The *Natural History*, by Pliny the Elder (23-79 A.D.), translated by John Bostock in six searchable volumes (London, 1855). Volumes 3, 4, and 5, in particular, deal with plants:

volume 1: Stars, planets, aerial phenomena, world geography.

volume 2: Geography continued, humanity, life cycles, terrestrial animals, fish, birds.

Volume 3: Insects, trees.

Volume 4: Grains, plants, remedies from plants, flowers, properties of plants and fruits, remedies from cultivated trees.

Volume 5: Remedies from forest trees, wild plants, remedies classified by disease, remedies from living creatures, remedies from waters.

Volume 6: **[includes General Index]**. Remedies from aquatic animals, history of metals, history of paintings and colors, stones, and precious stones.

Varro on Farming, translated with introduction, commentary and excursus by Lloyd Storr-Best (London, 1912), in 410 searchable pdf pages. Marcus Terentius Varro (116-27 B. C.) describes numerous aspects of farming, gardening, and usage of plants. He was an important source for Pliny the Elder.

Enquiry on Plants, by Theophrastus (c. 371- c. 287 B.C.), translated by Arthur Hort in two volumes (New York, 1916): volume 1, 517 pdf pages; volume 2, 526 pdf pages.

The Divine Origin of the Craft of the Herbalist, by E. A. Wallis Budge (London, 1928), in 94 searchable pdf pages. Topics include: The old gods as herbalists and their divine medicines; the divine herbalists; water a divine element; vegetable substances of divine origin; ancient Egyptian herbals and books of medicine; holy oils and medicated unguents; Sumerian and Assyrian herbals; the Greek herbals; the Latin herbals; the herbal in Syriac; the herbal in Arabic; Coptic lists of plants; the Ethiopian (Abyssinian) herbal.

Additional material is available on other pages:

Plant Aphrodisiacs
Plant Hallucinogens: Sacred Elements of Native Societies.

Folklore and Mythology

Plants and Flowers of Greek Myth, at theoi.com.

Folk-lore of Plants, by T. F. Thiselton-Dyer (New York, 1889), in 339 searchable pdf pages.

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Botanical Determination of the Middle Eastern Tree of Life, by J. Andrew McDonald, from *Economic Botany*, Vol. 56, No. 2 (Summer, 2002), pp. 113-129, in 18 pdf pages.

The Tree of Life in Indo-European and Islamic Cultures, by George Lechler, from *Ars Islamica*, Vol. 4 (1937), pp. 369-419, in 52 pdf pages.

Trees, Snakes and Gods in Ancient Syria and Anatolia, by W. G. Lambert, from *Bulletin of the School of Oriental and African Studies*, Vol. 48, No. 3 (1985), pp. 435-451, in 18 pdf pages.

Gilgamesh and the Magic Plant, by Ronald A. Veenker, from *Biblical Archaeologist*, Vol. 44, No. 4 (Autumn, 1981), pp. 199-205, in 8 pdf pages.

The Goddesses of the Egyptian Tree Cult, by Marie-Louise Buhl, from *Journal of Near Eastern Studies*, Vol. 6, No. 2 (Apr., 1947), pp. 80-97, in 19 pdf pages.

The Bee in Greek Mythology, by Arthur Bernard Cook, from *Journal of Hellenic Studies*, Vol. 15 (1895), pp. 1-24, in 25 pdf pages.

The Garden of Phoebus, by Joseph Fontenrose, from *American Journal of Philology*, Vol. 64, No. 3 (1943), pp. 278-285, in 9 pdf pages.

How the Apple Became the Token of Love, by Eugene Stock McCartney, from *Transactions and Proceedings of the American Philological Association*, Vol. 56 (1925), pp. 70-81, in 13 pdf pages.

The Folklore of the Daisy, by Katharine T. Kell, from *Journal of American Folklore*, Vol. 69, No. 271 (Jan. - Mar., 1956), pp. 13-21, in 10 pdf pages.

The Mandragora of the Ancients in Folk-Lore and Medicine, by Charles Brewster Randolph, from *Proceedings of the American Academy of Arts and Sciences*, Vol. 40, No. 12 (Jan., 1905), pp. 487-537, in 52 pdf pages.

The Mandrake Fiend, by H. F. Clark, from *Folklore*, Vol. 73, No. 4 (Winter, 1962), pp. 257-269, in 14 pdf pages.

The Fragrance of Biblical Mandrake, by Alexander Fleisher and Zhenia Fleisher, from *Economic Botany*, Vol. 48, No. 3 (Jul. - Sep., 1994), pp. 243-251, in 10 pdf pages.

Influence of Religion on the Spread of Citrus, by Erich Isaac, from *Science*, New Series, Vol. 129, No. 3343 (Jan. 23, 1959), pp. 179-186, in 9 pdf pages.

The Folk-Lore of Herbals, by Eleanour Sinclair Rohde, from *Folklore*, Vol. 33, No. 3 (Sep. 30, 1922), pp. 243-264, in 23 pdf pages.

The Medical Mythology of Ireland, by James Mooney, from *Proceedings of the American Philosophical Society*, Vol. 24, No. 125 (Jan. - Jun., 1887), pp. 136-166, in 32 pdf pages.

Gypsy Medical Folklore in Hungary, by Béla Gunda, from *Journal of American Folklore*, Vol. 75, No. 296 (Apr. - Jun., 1962), pp. 131-146, in 17 pdf pages.

Flowers and Flower Lore, by Hilderic Friend (Troy, N.Y., 1889), in 732 searchable pdf pages.

Myths and Legends of Flowers, Trees, Fruits, and Plants (Philadelphia, 1911), by Charles M. Skinner, in 336 searchable pdf pages.

Google Images:

Garden Flowers

Lilacs
Wild Roses
Cosmos
Lilies

Water Lilies
Lotus

Muscari armeniacum
Prunus armeniaca, Apricot
Dactylorhiza armeniaca/Dactylorhiza euxina
Phlomis armeniaca
Althaea armeniaca

Amanita armeniaca mushroom

Armeniaca

Levon (Ghewond) Alishan,

> Հայբուսակ Haybusak [Armenian Botany] (Venice, 1895). An encyclopedic Armenian-language work on the flora of the Armenian Highlands. This massive study (697 pdf pages) contains alphabetical entries for the major plants, trees, shrubs, as well as fungi. Many entries are accompanied by gorgeous, life-like drawings. There is also precious anecdotal evidence of these plants' usage by the Armenians of the 19th century and before. Latin, French, Turkish and Arab names (the last two in Armenian characters) appear in cross-referenced indices at the back. This is a major source for the study of Armenian ethnobotany.

Manuel Kajuni,

> Պարտիզպանութիւն Partizpanut'iwn [Gardening] (Venice, 1899). Beautiful methodical illustrated guide to gardening by type of plant and by season, in 392 pdf pages. A treasury of 19th-century Armenian cultivation lore. Some duplicate pages.

> Պտղաբանութիւն Ptghabanut'iwn [Fructiculture] (Venice, 1899). Illustrated guide to growing fruit trees, in 333 pdf pages. Includes a dictionary.

> Մեղուաբուծութիւն Meghuabutsut'iwn [Apiculture] (Venice, 1895). Illustrated guide to beekeeping, 268 pdf pages.

Ervand Lalayan,

> Ժողովրդական դեղեր Zhoghovrdakan degher [Folk Medicines], in 31 pdf pages. Lalayan's accounts of folk medicines and remedies used in four districts of historical Armenia, extracted from his larger studies in *Azgagrakan Hande's [Ethnographic Review]*: 1. Javaxk', 1(1895/1896), pp 300-308; 2. Zangezur, 4(1898), pp. 96-100; 3. Ganjak, 6(1900), pp. 316-320; 4. Borch'alu, 10(1903), pp. 156-167.

Step'an Zelinski,

Բոյսերի գործածութիւնը Երևանի նահանգում Boyseri gortsatsut'iwne" Erevani nahangum [Use of Plants in the State of Erevan], in 28 pdf pages from the journal *Azgagrakan Hande's [Ethnographic Review]* 4(1898), pp. 177-202. Zelinski describes the usage of wild and domesticated plants, providing the common Armenian names, along with Russian, and Latin names, and whether the plants are eaten raw, cooked, or used as herbs.

P. H. Davis,

Lake Van and Turkish Kurdistan: A Botanical Journey, from *Geographical Journal*, Vol. 122, No. 2 (Jun., 1956), pp. 156-165, in 17 pdf pages.

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Amirdovlat' Amasiats'i: His Life and Contributions, from *Journal of the Society for Armenian Studies* 3(1987), pp. 63-91, in 29 pdf pages. "During the years 1451 to 1481 Amirdovlat' was a practicing physician and an official surgeon at the Ottoman Court, while being a linguist, a traveler, an observer and collector of scientific facts and artifacts, and, finally, a rather rigorous experimentalist at a time when such figures were particularly rare." Gueriguian's study includes detailed sections on Amirodovlat's life, his scientific sources and corpus, his classic encyclopedic pharmacopeia, *Angitats' Anpe't' [Useless to the Ignorant]*, as well as his pharmacologic and therapeutic concepts.

John A. C. Greppin,

Comments on Early Armenian Knowledge of Botany as Revealed in the Geography of Ananias of Shirak, from *Journal of the American Oriental Society*, Vol. 115, No. 4 (Oct. - Dec., 1995), pp. 679-684, in 7 pdf pages.

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S. Avdalbekyan,

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Ethnobotanical Aspects of Some Taxa in East Anatolia, Turkey, by Fevzi Özgökçe and Hasan Özçelik, from *Economic Botany*, Vol. 58, No. 4 (Winter, 2004), pp. 697-704, in 9 pdf pages. Surveyed are the districts of Van, Hakkari, Siirt/Sgherd, Batman, Bingol/Chapaghjur, Tunceli/Dersim, Erzurum, Erzincan, Elazig, Malatya, Agri/Ararat, Kars, Mush, and Bitlis.

Traditional Medicine in Turkey VII. Folk Medicine in Middle and West Black Sea Regions, by Tetsuro Fujita, Ekrem Sezik, Mamoru Tabata, Erdem Yeşilada, Gisho Honda, Yoshio Takeda, Toshihiro Tanaka and Yoshihisa Takaishi, from *Economic Botany*, Vol. 49, No. 4 (Oct. - Dec., 1995), pp. 406-422, in 18 pdf pages. Surveyed are the districts of Amasya, Bilecik, Bolu, Çankiri, Samsun, Sinop and Tokat. 194 remedies obtained from 96 plant and 5 animal species are compiled. Vernacular names, parts used, methods of preparation, and medicinal usages are listed.

Traditional Medicine in Turkey VIII. Folk Medicine in East Anatolia, by Ekrem Sezik, Erdem Yeşilada, Mamoru Tabata, Gisho Honda, Yoshihisa Takaishi, Tetsuro Fujita, Toshihiro Tanaka and Yoshio Takeda, from *Economic Botany*, Vol. 51, No. 3 (Jul. - Sep., 1997), pp. 195-211, in 18 pdf pages. Surveyed are the districts of Erzurum, Erzincan, Agri/Ararat, Kars, and Igdir/Tsolakert.

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HISTORY OF GARDENS IN EAST ASIA: Online Resources

Gardens of China

General

- A Visual Sourcebook of Chinese Civilization: Gardens by Patricia Buckley Ebrey (University of Washington).
- Chinese Gardens and Collectors' Rocks, by the Metropolitan Museum of Art, New York. A brief overview of the history of gardens in China illustrated with artworks in the Met collection.
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Old Depictions of Gardens

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  - Jingshan Park, Wikipedia.
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    - The Sack of the Summer Palace. The famous open letter of 1861 by Victor Hugo in English translation.
    - Yuanming Yuan, le jardin du palais d'été. Detailed overview of the Yuanming Yuan based on a full publication of the 40-page album in the Bibliotheque Nationale de France. The album was commissioned in 1738 by the Qianlong emperor and painted by the court painters Tangdai and Shen Yuan. This site also includes various accounts of the gardens, including remarks by the Yongzheng and Qianlong emperors. The site is part of the website of the 2004 exhibition "Chine: l'Empire du trait." To access it, follow the link and click on the image at the bottom right.
    - Twenty Views of the European Palaces in the Garden of Perfect Brightness. Detailed reproduction of a set of the twenty engravings commissioned by the Qianlong emperor in 1783. This copy of the prints is kept at the University of Manchester Library, U.K. For some comments on the history of the Manchester book, see the note by Zheng Yangwen, "An Unexplained Image from the Garden of Perfect Brightness," *China Heritage Quarterly* 29 (March 2012).
    - Beijing Exhibits the Earliest Yuanmingyuan Photos. Images of the European Garden at Yuanming Yuan taken in 1873 by the German customs official and photographer Ernst Ohlmer (1847-1927). CRI
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Plants, Horticulture, and Botany

- Magical Miniature Landscapes: A Comprehensive History of Bonsai and the Related Arts, by Robert J. Baran.
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- Multilingual Plant Name Database, by Michel H. Porcher and friends in cooperation with the University of Melbourne.

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General

- The Japanese Garden by Clifton Olds (Bowdoin College)
- Japanese Garden. Wikipedia
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- Photographs of Japanese Gardens by William Corey

Gardens of Korea

- Korean Gardens: Where Man and Nature Become One, short article by Chung Jae-hoon (Korean National University of Cultural Heritage)
- Royal Palaces, Cultural Properties Administration of South Korea
- SoswaewonOverview and images of the famous Joseon-era garden in Damyang County (South Korea), originally built by Yang San-bo (1503-1557) as a retirement retreat. (Asian Historical Architecture)
- Soswaewon video tour.
- Soswaewon Official Website.
- Anapji Royal Pond, part of the Asian Historical Architecture site.
- Gyeongju National Museum, for images of some of the artifacts excavated at Anapji Pond.
- Garden of Morning Calm, a scenic botanical garden designed by Han Sang-kyung in the early 1990s, in Gyeonggi-do, South Korea.

Additional Resources

- Research Center for Japanese Garden Art, Kyoto
- The Japanese Garden Journal
- Chinese and Japanese Art History Virtual Library, by Nixi Cura

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Byzantine Garden Culture

edited by Antony Littlewood, Henry Maguire,
and Joachim Wolschke-Bulmahn

published by
Dumbarton Oaks Research Library and Collection
Washington, D.C.

Κηποποιΐα: *Garden Making and Garden Culture in the* Geoponika

Robert Rodgers

I have two main objectives in what follows. First, "the *Geoponika*" (as we call it) is a text that has been relatively ill served by editors, translators, and commentators, and thus its nature and purposes are rather too widely misunderstood. A brief introduction is in order.[1] Second, I should like to look more closely at the content of those books that deal with gardens, orchards, and flowers. What variety and kinds of information are presented? Can one discern contemporary practice from literary lore? How does one fairly and appreciatively use this text as a document illustrative of its era?[2]

The *Geoponika* is an agricultural and horticultural encyclopedia aiming to present in digest an accumulated practical lore of the ancients: those things that were collected for their usefulness.[3] It is the sole survivor—in Greek—of a long and rich tradition of such agricultural literature (stretching back at least to Hesiod, flourishing in the Hellenistic era,

[1] A convenient summary is that of H. Köpstein, "Geoponika," in *Quellen zur Geschichte des frühen Byzanz (4.–9. Jahrhundert): Bestand und Problem,* ed. F. Winkelmann and W. Brandes (Amsterdam, 1990), 323–26. The most recent edition is H. Beckh, *Geoponica sive Cassiani Bassi scholastici De re rustica ecologae,* B. G. Teubner (Leipzig, 1895), fundamentally criticized by E. Fehrle, "Richtlinien zur Textgestaltung der griechischen Geoponika," *Sitzungsberichte Heidelberg, Philosophisch-historische Klasse* (1920): Abh. 11. The most recent commentary is that of J. N. Niclas, *Geoponicorum siue de re rustica libri XX,* 4 vols. (Leipzig, 1781), which needs to be used closely in conjunction with J. G. Schneider's edition and commentary of Latin agricultural writers, *Scriptorum rei rusticae veterum latinorum . . .* (Leipzig, 1794–97). A translation into Russian was published by E. Lipshits (Moscow, 1960). Translation and commentary of two books is provided by S. Georgoudi, *Des chevaux et des boeufs dans le monde grec: Réalités et représentations animalières à partir des livres XVI et XVII des Géoponiques* (Paris-Athens, 1990). Individual books or pairs of books were subjects of University of Munich veterinary dissertations: bks. 13 and 15 by C. Krauss (1986), 14 and 20 by J. Sommer (1985), 16 and 17 by U. Wappmann (1985), 18 and 19 by H. Jung (1986). The present author has for some years been making haste slowly at a new critical edition, translation, and commentary.

[2] Cf. J. Wolschke-Bulmahn, "Zwischen Kepos und Paradeisos: Fragen zur byzantinischen Gartenkultur," *Das Gartenamt* 41 (1992): 221–28. I am only too well aware of how carefully L. Brubaker and A. R. Littlewood have performed a first harvest: "Byzantinische Gärten," in *Der Garten von der Antike bis zum Mittelalter,* ed. M. Carroll-Spillecke (Mainz am Rhein, 1992), 213–48; see also Littlewood's separate and complementary piece, "Gardens of Byzantium," *Journal of Garden History* 12 (1992): 126–53.

[3] Prologue to book 1: Τὰ διαφόροις τῶν παλαιῶν περί τε γεωργίας καὶ ἐπιμελείας φυτῶν καὶ σπορίμων καὶ ἑτέρων πολλῶν χρήσιμων εἰρημένα συλλέξας εἰς ἕν, τουτὶ τὸ βιβλίον συντέθεικα.

codified and "homogenized" by Roman writers in the first century of the common era).[4] The text in its present form dates from the mid-tenth century. This we know because it opens with an elaborate prologue addressed to Emperor Constantine VII (913–959), "sweet scion of the purple." The encomiast continues with reference to military victories; and he praises his monarch for the restoration (or renaissance: καινισμός) of philosophy, rhetoric, and the entire range of science and art. The state consists of three parts: army, clergy, and agriculture—a collocation, incidentally, that gives a characteristically Byzantine twist to a literary convention of the king as warrior-farmer in his own right.[5] Xenophon's *Oeconomicus* (4.20–25) reports how Cyrus delighted to tell the visiting Lysander that his remarkable παράδεισος[6] at Sardis was a personal labor: "I measured and arranged the whole, and some of the plantings I did myself" (ἐγὼ πάντα καὶ διεμέτρησα καὶ διέταξα, ἔστι δ᾽ αὐτῶν, φάναι, ἃ καὶ ἐφύτευσα αὐτός), to which Lysander, astonished, asked, "Did you really plant part of these with your very own hands?" (ἦ γὰρ σὺ ταῖς σαῖς χερσὶ τούτων τι ἐφύτευσας;). Nor was the convention by any means in desuetude on the eve of Constantinople's founding. The anonymous *Epitome de Caesaribus* (39.6) tells how Diocletian cheerfully refused a suggestion to resume the imperial role: "If you only could view the vegetables at Salona planted by our hands, surely you would never urge even the contemplation of such a thing" ("utinam Salonae possetis visere olera nostris manibus instituta, profecto numquam istud temptandum iudicaretis").

Agriculture was not alone in receiving special attention at the imperial court in the Macedonian renaissance. The *Geoponika* was one of a series of similar compendia, excerpted or compiled from ancient writings, that were put together under the auspices of Constantine VII. The intellectual atmosphere and its literary production were lucidly delineated by Paul Lemerle, and we honor him rightly by using his term—*encyclopédisme*—for this stage of Byzantine humanism.[7] In many ways the closest parallel we have to the *Geoponika* is to be found in the collection known as the *Hippiatrika,* excerpts from late antique writers on veterinary medicine.[8] Leaves of a sumptuous tenth-century manuscript (now Berlin, Staatsbibl.

[4] An excellent introduction is that of J. L. Teall, "The Byzantine Agricultural Tradition," *DOP* 25 (1971): 35–59.

[5] Parts of the convention go back as far as Homer's *Odyssey:* e.g., in *Odyssey*, book 24, Laertes is retired to his orchard.

[6] According to the *Oxford English Dictionary,* the word derives from Old Persian *pairidaeza,* "enclosure, park," from *pairi,* "around" [cf. Grk. παρά] + *diz* "form, mould." Its first use in Greek was by Xenophon in reference to *enclosed* parks of Persian kings (see H. G. Liddell and R. Scott, *Greek-English Lexicon, With a Supplement* [Oxford, 1968]). More could be said on the "enclosure" in anthropological context, with the implication that crop growing superseded a hunter-gatherer society. Yet more could be said on the etymology of Latin *hortus,* leading to co-hort > court (both royal and architectural).

[7] P. Lemerle, "L'encyclopédisme de Constantin Porphyrogénète," *Bulletin de l'Association Guillaume Budé,* suppl. Lettres d'Humanité, 3d ser., 4 (1953): 64–72. In wider context, see also Lemerle's *Le premier humanisme byzantin: Notes et remarques sur enseignement et culture à Byzance des origines au Xe siècle* (Paris, 1971), esp. 288–92, 332–36. This work is now available in English: *Byzantine Humanism, The First Phase,* trans. H. Lindsay and A. Moffatt (Canberra, 1986).

[8] For the *Hippiatrika,* see A.-M. Doyen-Higuet, "The *Hippiatrica* and Byzantine Veterinary Medicine," *DOP* 38 (1984): 111–20.

Phill. 1538) illustrate the elegance of format lavished upon imperial productions of what strike us as highly technical writings. No such luxurious codex survives of the *Geoponika,* although by the "jigsaw" decoration on its title page Kurt Weitzmann has dated to the period of Emperor Constantine a relatively ornate copy of this text and the oldest that survives, now in Florence (Laur. Plut. LXXIV, 7).[9]

Where the *Geoponika* has, for its part, outshone the other products of imperially sponsored *encyclopédisme* is in the number of its surviving manuscripts (some fifty, dating from the 10th to the 16th century). Scholars have noted an enthusiastic sequel to its *editio princeps* (Basel, 1539) and a practical value attached to its contents well into the nineteenth century.[10] Less carefully studied is the intimate relationship between this Byzantine compendium (which came to scholarly notice in the Renaissance) and the parallel literary traditions that perpetuated Greco-Roman agricultural knowledge in the Latin West and in the world of Islam. The simplified stemma sketched in Table 1 shows some main lines of a complex tradition. The *Geoponika* (in its Constantinian form) appears in the lower right portion of the diagram.

How was the work compiled? The ancestry depicted on the chart is essentially the work of Eugen Oder and Eugen Fehrle at the end of the nineteenth century and the beginning of the twentieth.[11] Unequivocally central to the legacy of content and form in the *Geoponika* is the work of a fourth-century writer, Vindonius Anatolius of Beirut. Very probably, although not certainly, Anatolius can be identified with the prefect of Illyricum of that name mentioned by Ammianus Marcellinus; he was a distinguished jurist at Beirut and a friend of the orator Libanios.[12] Why exactly Anatolius chose to compile a *Collection (Synagoge) of Agricultural Practices* (Συναγωγὴ γεωργικῶν ἐπιτηδευμάτων) we do not know, although he fits the pattern of literary flurry at the end of antiquity and his work parallels or complements contemporary collections on other technical subjects: for example, medicine, both human and veterinary.[13] We do know that Anatolius' work was enormously successful. Despite the survival of a mere half page of his original Greek text, from those who followed and built upon Anatolius' *Synagoge* (close to "plagiarized" in our use of that word) we can

[9] K. Weitzmann, *Studies in Classical and Byzantine Manuscript Illumination* (Chicago-London, 1971), 192–95 (with fig. 175): "It is only the fact that the Florentine *Geoponica* manuscript lacks the elegant script and the refined ornament which one would expect to find in the exemplar dedicated to the emperor that speaks against its being such a copy." To this judgment I should also add that the *text* of the codex Florentinus is not of "imperial quality."

[10] Teall, "Byzantine Agricultural Tradition"; N. G. Wilson, *Scholars of Byzantium* (Baltimore, Md., 1983), 143. To Teall's copious bibliography, add J.-M. Olivier, "Le 'codex Aurogalli' des *Geoponica,*" *Revue d'histoire des textes* 10 (1980): 249–56.

[11] E. Oder, "Beiträge zur Geschichte der Landwirthschaft bei den Griechen," *RhM* 45 (1890): 58–99, 212–22, and 48 (1893): 1–40; E. Fehrle, *Studien zu den griechischen Geoponikern,* ΣΤΟΙΧΕΙΑ 3 (Leipzig-Berlin, 1920). Some modifications have become necessary because of more recent discoveries and additional research in oriental traditions; see note 16 below.

[12] A. H. M. Jones, J. R. Martindale, and J. Morris, *The Prosopography of the Later Roman Empire,* vol. 1, *A.D. 260–395* (Cambridge, 1971), s.v. Anatolius 3.

[13] By way of introduction, V. Nutton, "From Galen to Alexander: Aspects of Medicine and Medical Practice in Late Antiquity," *DOP* 38 (1984): 1–19.

largely reconstruct both the form and content of his work. Not only did Palladius use it in the West (and Palladius was *the* agricultural handbook for the western Middle Ages, thanks perhaps to the endorsement of Cassiodorus, *Institutes,* 1.28.6),[14] but it was also translated into Syriac and thence to Arabic (eventually to Armenian). We are fortunate, too, that Patriarch Photios, writing in the ninth century, included a brief notice of Anatolius' work. He called it "a useful book, as we have often found by direct experience, for agricultural activities and the tasks of the farmer, perhaps more useful than any of the others that treat of the same subjects. However, it too contains some irrational and incredible elements, reeking of pagan folly, which the pious farmer needs to avoid while he gathers good advice from the remainder."[15]

More important for our purposes, Anatolius' *Synagoge* was incorporated as the primary source of *Selections on Agriculture* (Περὶ γεωργίας ἐκλογαί) compiled by one Cassianus Bassus "Scholasticus," a very shadowy figure whose title probably fixes him in the sixth century, although we have no good clues as to the location of an area called "Maroton" to which his is apparently the personal reference (ἐν τῷ Μαροτωνύμῳ χωρίῳ, *Geoponika,* 5.6.6). Like the work of Anatolius, Cassianus' *Selections* circulated widely and early on. Besides the oriental versions, successive reworkings of his compilation took place in the Byzantine tradition, the most important of which was the wholesale incorporation of his work into the Constantinian corpus we call the *Geoponika.* (We can make this assertion because some 80 to 85 percent of the whole *Geoponika* is so close to the surviving Arabic works in both arrangement and content—and this despite the phenomena of "translations" and the "fluidity" of the Arabic tradition in its own right.)[16]

Evidence so far available does not allow us to do much by way of illuminating the intervening stages between sixth-century Cassianus and the tenth-century encyclopedist(s). An early thirteenth-century manuscript in Venice (Marcianus gr. 524) differs in some interesting ways from the remaining witnesses to the text of the *Geoponika.* The incipit of the Marcianus reads (fol. 190r) Ἀρχὴ σὺν θ[ε]ῷ τῶν περὶ γεωργίας ἐκλογῶν: Κασσιανοῦ Βάσσου σχολαστικοῦ. There is no prologue addressed to Constantine VII, and in the formulaic sentences at the beginning of books 7, 8, and 9 we can still read a parenthetical vocative, "my dear son Bassus."[17] Yet the suggestion that the Marcianus represents the text of Cassianus Bassus is too facile a conclusion, despite the evident vestiges of that work

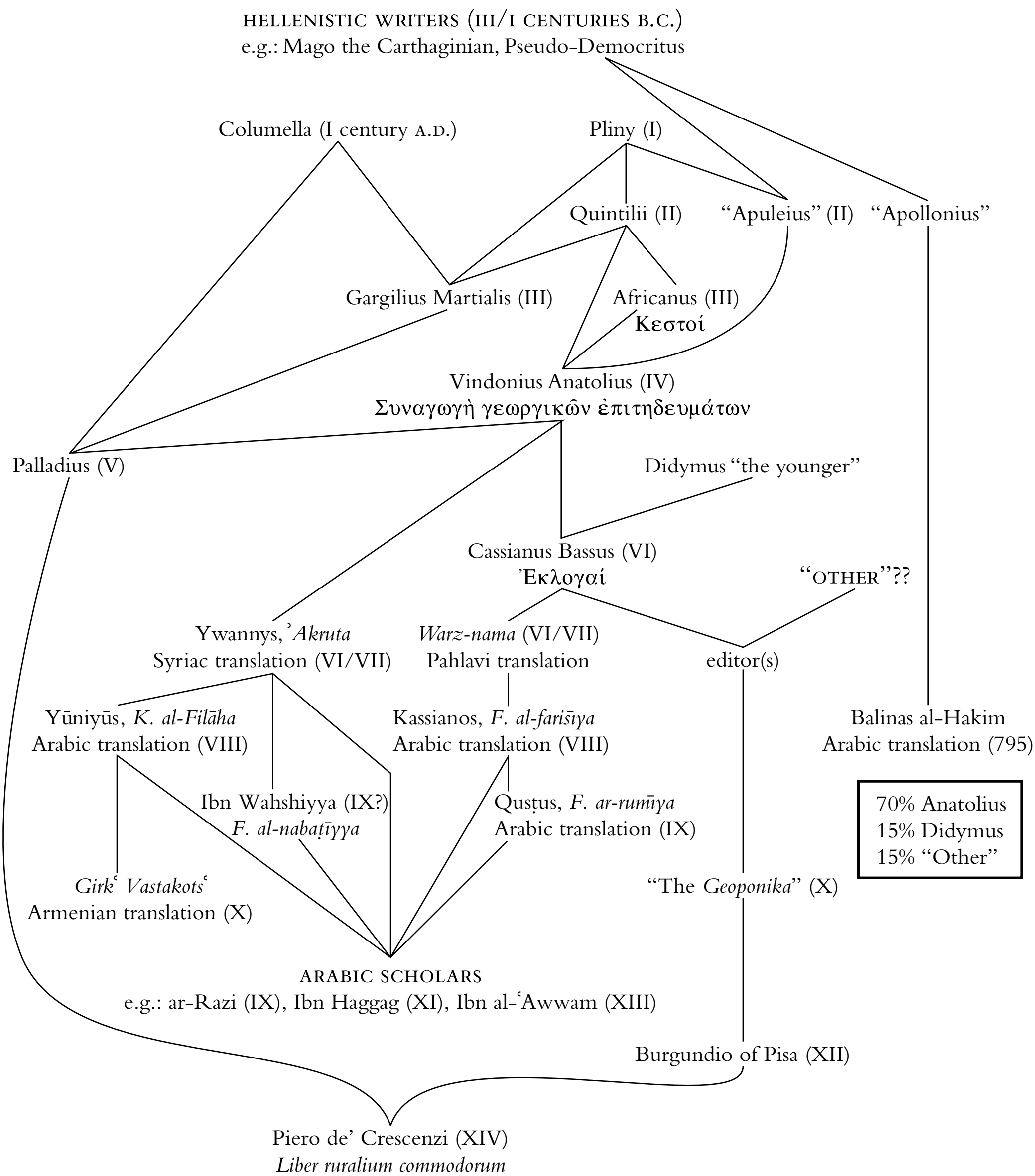
[14] J. Svennung, "De auctoribus Palladii," *Eranos* 25 (1927): 123–78, 230–48; R. H. Rodgers, *An Introduction to Palladius,* Bulletin of the Institute of Classical Studies, suppl. 35 (London, 1975); "Palladius," in *Catalogus Translationum et Commentariorum,* ed. F. E. Cranz, vol. 3 (Washington, D.C., 1976), 195–99.

[15] *Bibliotheca,* cod. 163: *The Bibliotheca: A Selection,* trans. N. G. Wilson (London, 1994), 147–48. Photios lists also the sources upon which Anatolius drew, and his report is of special value for comparison with the authorities named in the preface to the *Geoponika* and in certain of the oriental versions.

[16] For the Arabic tradition, in addition to the bibliography cited by Teall, "Byzantine Agricultural Tradition," see F. Sezgin, *Geschichte des arabischen Schrifttums,* vol. 4 (Leiden, 1971), 310–18, and vol. 5 (1974), 427; M. Ullmann, *Die Natur- und Geheimwissenschaften im Islam* (Leiden, 1972), 433–36; B. Attié-Attié, "L'origine d'al-falāḥa ar-rūm īya et du pseudo-Qusṭus," *Hespéris Tamuda* 13 (1972): 139–81.

[17] E. Mioni, *Bibliothecae Divi Marci Venetiarum Codices Graeci Manuscripti,* vol. 2 (Rome, 1985), 399. A second Marcianus (gr. 294, dated late 13th century) belonged to Bessarion: ibid., vol. 1 (Rome, 1981), 420.

Table 1
Literary Traditions of Agricultural Writers



which this manuscript does preserve. Aside from the absence of the prologue, the overall text of the Marcianus, give or take trifles here and there, is the same as other *Geoponika* manuscripts: significantly it includes what are apparently "Constantinian" features, such as the chapter on the growing season for vegetables in the area of Constantinople (*Geopon.,* 12.1), and mythologies associated with certain plants in chapters of book 11. Second, the Arabic versions derived from Cassianus (both "Kassianos" and "Qusṭus" in Table 1) reveal an

organization and book division agreeing far more closely with the Arabic "Yūniyūs" (i.e., Anatolius) than with that in the Constantinian *Geoponika.* Hence one can discern that the twenty-book collection as we have it in Greek is post-Cassianus: it is likely, but perhaps not subject to proof, that many of the repetitive elements in the *Geoponika* are introductions made as part of the tenth-century redaction.

Both tedious and inappropriate for extensive discussion here, but yet essential of note is that there remains much work to be done in determining the stage(s) at which names (in the genitive case) were attached to chapter headings in the *Geoponika.* That these names are not part of the transmitted literary tradition as such is generally accepted (in contrast to the situation with the *Hippiatrika*). To suggest that they were wholesale fabrication on the part of the Byzantine encyclopedists is neither charitable nor tenable (given the demonstrable validity of some of the ascriptions as confirmed by independent and pre-Constantinian evidence). And the manuscripts themselves behave in both inconsistent and idiosyncratic ways. As a preliminary conclusion I submit that the Constantinian editorial endeavor was no more than the starting point—if even that—for attempting a systematic pattern of chapter title + "name of authority." Subsequent readers and copyists continued the process with widely differing standards and purposes. One point needs to be made emphatic: until each and every one of the authorities named in the chapter headings has been examined in light of the manuscript tradition of the *Geoponika* itself and in comparison to the more complicated tradition that underlies this compendium, these names ought not to be cited as if they were a reliable index of transmitted truth.[18] To give but one example, the chapter heading for *Geoponika,* 10.1, to be discussed below, reads as follows: Περὶ παραδείσου. Φλωρεντίνου. A certain Florentinus is prominently named as *one* of Anatolius' sources, but only in the *Geoponika* chapter heading is he credited as an authority for *this* chapter.[19] As we shall see, the chapter that now stands as *Geoponika,* 10.1, has apparently undergone little change from the version compiled by Anatolius six centuries earlier. Nowhere do we have good evidence that this *Geoponika* chapter derives in any way from a work by Florentinus.

Let us turn to the larger questions of the overall contents of the *Geoponika* and the extent to which any of this material may be used to illustrate the actual culture of fields or gardens, either in theory or practice, in the tenth century or at any other point along its literary lineage. Views on this issue have been diametrically opposite. E. E. Lipshitz, who studied this work and translated it into Russian in 1960, focused on a few clearly Byzantine references and felt that it could be useful as a rich source for documenting contemporary tenth-century agricultural practice. But she overlooked the fact that the overwhelming mass of

[18] For bibliography on this problem, see my "The Apuleius of the *Geoponica,*" *California Studies in Classical Antiquity* 11 (1978): 197–207; "Varro and Virgil in the *Geoponica,*" *GRBS* 19 (1978): 277–85; "¿Yūniyūs o Columela en la España medieval?" *al-Andalus* 43 (1978): 163–72.

[19] Photios, *Bibliotheca,* cod. 163 (Florentios); *Geopon.* 1 prol. (Florentinos); Teheran ms. of Yūniyūs (Filurintinus), etc. Florentinos is cited several times within the text of the *Geoponika* chapters (for these there is no reason to question the reliability of ascription). For discussion of the man's identity and his agricultural writings, see Oder, "Beiträge," 83–87.

the content was part and parcel of a long literary tradition that had homogenized agricultural theory and practice from the entire Mediterranean region and had been circulating with only minor and mostly superficial changes from the first century of our era. Lemerle, whose judgment rested in part on comparison of the *Geoponika* with its sibling encyclopedias produced in the tenth century, went to the other extreme, suggesting that the only originality to be discerned was the purple prologue addressed to Emperor Constantine.[20] The truth no doubt lies somewhere in the middle, but nearer (as I see it) to Lemerle's end of the scale than to that of Lipshitz. The only way to come closer to understanding is by patient analysis of the text—the actual substance, not just the chapter titles—and careful study of the problems surrounding the literary sources on which it is almost entirely based.

Table 2 provides a general "table of contents" to the *Geoponika* as a whole (books 1–20), and Table 3 provides translations of the individual chapter headings for three of the books (10–12) that deal to some degree with orchards and gardening. From the two tables one gains not only a sense of the range of material covered, but, because the chapters are so specific, one has practically a comprehensive index of plants for which the *Geoponika* gives instructions on culture and usefulness.[21]

There is much repetition from chapter to chapter, for each of the disjunctive units focuses upon an individual plant (many of which have a very similar or virtually identical culture). The discussion ranges widely: appropriate soil type, planting season, grafting techniques, methods of preservation, therapeutic applications, medicinal recipes. Further overlap occurs with other portions of the *Geoponika*. There are numerous references to sympathetic plantings and plant combinations to be avoided: in more than one place in other books we have specific chapters outlining the "Democritean" doctrine of sympathy and antipathy.[22]

Another example of overlap is with the more extensive treatment set forth in book 1, concerning weather damage and pests. Book 1, chapter 14, "On hail," provides a particularly interesting and instructive example. Chance has preserved for us this chapter alone of Anatolius' Greek text (in Paris, B.N. gr. 2313, fol. 49v), and it can be compared sentence by sentence to each of the parallel versions deriving from Anatolius: Palladius, Syriac, Arabic, *Geoponika*.[23] This single passage thus serves as a useful control to monitor how little free

[20] Succinctly stated by A. Kazhdan in *ODB,* 2:834, s.v. "Geoponika." For a similar assessment in the Latin West, see P. Meyvaert, "The Medieval Monastic Garden," in *Medieval Gardens,* ed. E. B. MacDougall (Washington, D.C., 1986), 31: "but in all probability they were very seldom consulted by the monastic gardener. What these books contained was a literary tradition having little or nothing to do with the practical side of horticulture."

[21] I confess to some slight awkwardness in excluding entirely vineyards and olive groves (books 4–9). Almost certainly an owner or overseer of a small and self-sufficient estate would have thought of both as part of the "garden."

[22] Both the repetitive nature of literary treatments and the "Democritean" attitude toward plants and planting could copiously be illustrated in Columella and Pliny the Elder, the two most important synthetic works that survive from the 1st century of our era. As for the latter author, too often dismissed as tedious and contemptible, I cannot let pass the opportunity to mention the recent work by M. Beagon, *Roman Nature: The Thought of Pliny the Elder* (Oxford, 1992), esp. 79–91 on gardens.

[23] Identified and published by H. Beckh, "De Geoponicorum codicibus manuscriptis," *Acta seminarii philologici*

Table 2
The *Geoponika:* A Table of Contents

Book Number	Contents in General	No. Chapters	No. Pages
1	Astrological Weather Lore	16	27
2	Siting, Soil, Water Management, Cereals and Legumes	48	53
3	Farmer's Calendar by Months [3 intrusive chapters]	15	16
4	Vines, Viticulture, Wine	15	18
5	Vines, Viticulture, Wine (includes Pests in Vineyard)	53	45
6	Vines, Viticulture, Wine	19	16
7	Vines, Viticulture, Wine	37	27
8	Vines, Viticulture, Wine [recipes]	42	14
9	Olive Trees, Olives, Oil	33	28
10	Garden, Fruit Trees	90	62
11	Ornamental/Medicinal Plants (includes Mythological Snippets)	29	38
12	Vegetables	41	38
13	Pests and Vermin	18	18
14	Poultry	26	26
15	Bees	10	19
16	Horses	22	17
17	Cattle	29	14
18	Sheep, Goats	21	16
19	Dogs, Swine, Game	9	11
20	Fish (mainly recipes for bait)	46	17

adaptation and extensive rearrangement actually occurs compared to what one might have expected.

Surely Patriarch Photios would have had his readers forego many of the procedures outlined in the chapter on hail, and vestiges of editorial excision are apparent at this very point in the manuscript tradition of the *Geoponika.* On the other hand, the danger of hail to growing crops was familiar and omnipresent (a hail-filled sky is depicted above Gregory of Nazianzos preaching on hail in Paris, B.N. gr. 510, fol. 78r, a 9th-century manuscript of his homilies).[24] Accretions to the list of possible remedies for hail are also to be found. To Cassianus' version, apparently, we owe the suggestion of averting hail by stringing keys and

Erlangensis 4 (1886): 268–70; studied in detail by Fehrle, *Griechischen Geoponikern,* 7–14. Compare now the similar study setting Anatolius alongside the derivative material in the so-called *Nabataean Agriculture:* R. H. Rodgers, "Hail, Frost, and Pests in the Vineyard: Anatolius of Berytus as a Source for the *Nabataean Agriculture,*" *JAOS* 100 (1980): 1–11.

[24] Brubaker and Littlewood, "Byzantinische Gärten," pl. 30.

Table 3
The *Geoponika:* Books 10–12

Geoponika, book 10—embracing the subject of garden making and the advantage and pleasure from them and when it is necessary for each of the trees to be planted, and what graftings are most useful.

1 Garden (παράδεισος)
2 Planting trees
3 Trees from seed, buds, cuttings, and slips (ἀπὸ σπέρματος, παρασπάδος, πασσάλου)
4 Date palms (φοῖνιξ)
5 Date palm fruits
6 Palm leaves for weaving
7 Citron trees (κίτριον), red fruit
8 Good crop of citron
9 Shaped citron (bird, human face, etc.)
10 Preserving citrons
11 Pistachio (ψιττάκια)
12 Pistachio
13 Peach (δωρακινά, περσικά)
14 "Written" peaches
15 Red peaches
16 "Pitless" peaches
17 Grafting peaches
18 Apples (μῆλα)
19 Red apples
20 Grafting apples
21 Preserving apples
22 Pears (ἀππίδιον), not "stony"
23 Pears
24 Grafting pears
25 Preserving pears
26 Quinces (κυδώνια)
27 Shaped quinces
28 Preserving quinces
29 Pomegranates (ῥοιά)
30 "Unburst" pomegranates
31 "Seedless" pomegranates
32 Pomegranate branch for insectifuge
33 Redder pomegranate
34 Sweeter pomegranate
35 Good crop of pomegranates
36 Reckoning number of seeds in a pomegranate fruit
37 Grafting pomegranate
38 Preserving pomegranates
39 Plum (δαμασκηνή)
40 Preserving plums
41 Cherries (κεράσια)
42 Preserving cherries
43 Jujube (ζίζυφον)
44 Preserving jujube
45 Figs (σῦκα)
46 Keep figs wormless
47 "Inscribed" figs
48 Keep figs from dropping
49 Tame wild fig
50 Scab-infested fig
51 Figs as purgative, early ripening (Democritean)
52 Grafting figs
53 Multicolored figs
54 Preserving dried figs
55 Winter figs, unripe figs
56 Preserving green figs
57 Almonds (ἀμυγδαλαί)
58 Harvest almonds
59 Sweeten bitter almonds
60 "Written" almonds
61 Cure sterile almond tree
62 Grafting almond
63 Chestnuts (κάστανον)
64 Nut tree (κάρυα)
65 Grafting nut tree
66 "Naked" nuts
67 "To dry up" nuts and other trees
68 Hazel nuts (ποντικόν)
69 Mulberries (συκάμινα) and making them white
70 Preserving mulberries
71 Medlar (μέσπιλον)
72 Carob tree (κεράτια)
73 Interpreting types of fruits
74 Difference between soft (ὀπώρα) and hard (ἀκρόδρυα) fruits
75 Season for grafting trees
76 Twig grafts (ἐμπηυλλισμός) and boring grafts (ἐγκεντρισμός)
77 Ocular or bud grafts (ἐνοφθαλμισμός)
78 Pruning
79 For weather-damaged trees

80 Warding off birds
81 Plantings
82 Recipes for fruitfulness
83 Production from sterile tree
84 Treatment for damaged trees
85 Transplanting grown trees even in fruit

86 Trees from seeds
87 To avoid dropping fruit
88 Treating drop of blossoms or leaves
89 Avoiding harm by livestock (Democritean)
90 Avoiding damage from worms and the like

Geoponika, book 11—embracing the "wreath" trees (στεφανοματικά) and the ever-leaved trees, also planting of roses, lilies, violets, and other aromatic plants.

1 Trees that are ever-growing or nondeciduous
- Olives (ἐλαία) [= *Geopon.,* 9.1, repeated]
2 Laurel (δάφνη) myth
3 Grafting laurel, from seed, suckers
4 Cypress (κυπάρισσοι) myth
5 Cypress
6 Myrtle (μυρσίνη) myth
7 Myrtle
8 Preserving myrtle berries
9 Boxwood (πύξος)
10 Pine (πίτυς) myth
11 Pine
12 Mastich tree (σχῖνος)
13 Willow (ἰτέα)
14 Holm oak (πρῖνος)
15 Frankincense tree (δενδρολίβανον) myth
16 Frankincense tree
17 Rose (ῥόδος) myth
18 Roses, aromatic, everblooming
19 Lily (κρῖνα) myth
20 Lily
21 Iris (ἶρις)
22 Violet (ἴον) myth
23 Violet
24 Narcissus (νάρκισσος) myth
25 Narcissus
26 Crocus (κρόκος)
27 Marjoram (σάμψυχον), saussurea (κόστος), costmary (βάλσαμος)
28 Basil (μισόδουλον, ὤκιμον)
29 Ivy (κιττός) myth
30 Ivy

Geoponika, book 12—embracing the planting and culture of different vegetables, which one should plant in each month, and remarkable garden-construction, and useful properties of vegetables.

1 Calendar by month of sowing and planting in region of Constantinople
2 Garden making
3 Soil for vegetables
4 Fertilizer
5 Vegetables in arid region
6 For productive growth
7 To avoid insects and birds
8 To avoid worms
9 Get rid of leek-bugs (πρασοκουρίδες)
10 Companion plantings
11 Harm to the garden
12 Mallow (μαλάχη) and its uses
13 Lettuce (θρίδαξ)
14 Lettuce with parsley (σέλινον), rocket (εὔζωμον), basil (ὤκιμον) from same root
15 Root vegetables (σεῦτλα)
16 Remedies from miscellaneous vegetables
17 Cabbage (κράμβη)
18 Asparagus (ἀσπάραγος)
19 Pumpkins (κολοκύντη) and cucumbers (σίκυος), with early and seedless varieties
20 Melons (μηλοπέπονες)
21 Cress (γογγύλη)
22 Radishes (ῥαφανίδες)
23 Parsley (σέλινα)
24 Mint (ἡδύοσμον)
25 Rue (πήγανον) cultivated and wild
26 Rocket (εὔζωμον)
27 Pepperwort (κάρδαμον)
28 Endive (σέρις)
29 Leeks (πράσα)
30 Garlic (σκόρδα)
31 Onion (κρόμυα)
32 Hartwort (καυκαλίδες)
33 Pennyroyal (γλίχων)
34 Dill (ἄνηθον)
35 Peppercress (σκίμβρον)
36 Bulbs (βολβοί)
37 Squill (σκίλλη)
38 Sorrel (λάπαθον)
39 Artichokes (κινάρες)
40 Purslane (ἀνδράχνη)
41 Mushrooms (μύκητες)

hanging them about the property (*Geopon.,* 1.14.6). Nowhere but in the Constantinian *Geoponika,* however, do we read the curious prescription that then follows (1.14.7), to set up "wooden bulls" (ταύρους ξυλίνους), and more than slightly attractive is P. Hamblenne's emendation to σταυρούς.[25] *Geoponika,* 1.14, then, with its evidence of addenda and editorial changes, illustrates an important point: Byzantine readers did take some note of what ancient texts had to say.

I mentioned earlier two instances of what are evidently tenth-century contributions to the *Geoponika.* The first of these is the series of ten mythological "nuggets" inserted at appropriate points prefatory to the discussion of individual plants in book 11 (chap. 2, laurel; chap. 4, cypress; chap. 6, myrtle; chap. 10, pine; chap. 15, frankincense tree; chap. 17, rose; chap. 19, lily; chap. 22, violet; chap. 24, narcissus; chap. 29, ivy). By way of illustration, Table 4 gives the text and translation of *Geoponika,* 11.29 (Περὶ κιττοῦ. Ἱστορία). Nothing parallels these short chapters in the oriental versions of agricultural literature. Both the language and the decorative pedantry betray the encyclopedist's touch. While the source or sources of these brief mythologies is not specifically known, it may be supposed that they come from schoolbooks or rhetorical models. That they are incorporated into a compendium that preserves "the advice of the ancients" is not without interest to show at least a mild tolerance of paganism that could be intellectually consistent with Byzantine classicism.

The other tenth-century addition is the longish opening chapter of book 12 ("By month what is sown and planted in the region of Constantinople"). Again, there is no evidence that such a listing of vegetables and greens was included in earlier versions, and details of its vocabulary studied recently support the view that this chapter is a properly Byzantine product, perhaps in origin a specialized calendar drawn up in a context of market supply for the capital.[26]

Ancient and perennial was the intellectual fascination that attached to the possibilities of improving upon nature. With their enclosed and irrigated orchard, vineyard, and orderly rows of greens, the storied gardens of Alkinoos (*Odyssey,* 7.112–32) outshone the flourishing grove, vine, and soft flowery meadows of Kalypso's island (*Odyssey,* 5.63–74). The *Geoponika* gives full attention to marvels of τέχνη. Results (real or theoretical) ran the gamut from what moderns would call experimental improvement all the way to impractical—even impossible—exotic features. Grafting, for instance, is extensively treated,[27] and procedures are repeated from long centuries of literature even though some combinations were quite impossible. Recipes for altering the quality and appearance of fruit had sometimes a straightforward cosmetic appeal (better coloring), but could aim more ambitiously at producing

[25] Fehrle, *Griechischen Geoponikern,* 10–11, 20–21; P. Hamblenne, "Un rite chrétien dans les 'Géoponiques'?" *AntCl* 47 (1978): 184–86; see further D. R. Jordan, "On an Emendation of the Text of the *Geoponica,*" *AntCl* 52 (1983): 277–78.

[26] J. Koder, *Gemüse in Byzanz: Die Versorgung Konstantinopels mit Frischgemüse im Lichte der Geoponika* (Vienna, 1993).

[27] The phenomenon of grafting was one important innovation at the end of the Dark Ages: see V. D. Hanson, *The Other Greeks: The Family Farm and the Agrarian Roots of Western Civilization* (New York, 1995), 41–45.

Table 4
Geoponika, 11.29: Περὶ κιττοῦ. Ἱστορία

Κιττός, τὸ ἄνθος, νέος ἐτύγχανε πρότερον, χορευτὴς Διονύσου γενόμενος. χορεύων δὲ τῷ θεῷ πρὸς τὴν γῆν καταφέρεται· καὶ Γῆ τιμῶσα Διόνυσον ἄνθος ἀνῆκεν ὁμώνυμον βλάστημα, σώζουσα τὰ τοῦ νέου βλαστήματα. προιὼν μὲν γὰρ ἐκ γῆς ἄμπελον περιπλέκεσθαι πέφυκεν, οὕτως περιπλεκόμενος, ὡς ὅτε νέος ἐχόρευσεν.	Ivy (Kittos), the plant, once was a young man, a dancer of Dionysos. Dancing for the god he fell dead upon the ground, and in honor of Dionysos, Earth brought forth a shoot with the same name, thereby preserving the stock of the young man. The plant as it springs from the earth is accustomed to embrace the vine just as the young man once danced embracing the god.

exotic shapes. Behind the instructions for shaped fruits and vegetables are traditions represented in Theophrastus, Columella, and Pliny.[28] The first flurry of such literary works combining "science" with "magic" came in the Hellenistic era, but a second marked the Second Sophistic and its sequel in late antiquity—exactly the period during which the main forerunners of the *Geoponika* were compiling their comprehensive works.

Too good to pass by for its curiosity is *Geoponika,* 12.11, "Harm to the garden": Dissolve goose dung in brine and sprinkle the plants with it (Χηνῶν ἀφόδευμα ἅλμῃ λύσας ῥαῖνε τὰ λάχανα). Is this a kind of weed killer? Ancient authors mention the harmful properties of salt water and tell us to keep an eye on the geese, but there is no parallel to this curiously negative recommendation. The "authority" named in the chapter heading is Afrikanos, and despite my own firm admonition above, I am very tempted to believe that this prescription may have come from Julius Africanus (a known source of Anatolius), from whose Κεστοί Psellos cites a number of examples that closely resemble passages in the *Geoponika*. This particular "harm to the garden" could readily have been mentioned in that portion of the work that Psellos describes: "A craftsmanlike, or rather sorcerous, fertility he produces in fields, and the opposite barrenness by antipathies."[29]

Among the ancient literary traditions encapsulated in the *Geoponika* are occasionally to be found some Byzantine surprises, for example, the one in *Geoponika,* 12.83, a chapter not known to be paralleled in any of the oriental versions. A glance at Table 5 shows that this chapter bears strong resemblance to the Gospel parable in Luke 13:6–9. I have not located a specific *literary* source from which the encyclopedists may have drawn it, nor do I think that a Byzantine reader needed one—any more than a literary source was prerequisite

[28] *Historia plantarum,* 7.3.5: "Some things come to resemble in their shapes even the position in which they grow: thus the gourd likens its shape to the container in which it has been placed" (ἔνια δὲ καὶ τοῖς σχήμασιν ἐξομοιοῦνται καὶ τοῖς τόποις· ἡ γάρ σικύα ὁμοιοσχήμων γίνεται ἐν ᾧ ἂν τεθῇ ἀγγείῳ); Columella, 11.3.48–53; Pliny, *Naturalis historia,* 19.70. The practical application is recommended by modern authors: see W. Robinson, *The Vegetable Garden,* 3d ed. (New York, 1920), 270: "Should any young fruits exhibit a tendency to become crooked, they put them into cylindrical glasses open at both ends, . . . as one good and straight cucumber is worth nearly a dozen small and deformed ones."

[29] *Paradoxographoi,* ed. A. Westermann (London, 1839), 143–46; trans. F. C. R. Thee, *Julius Africanus and the Early Christian View of Magic* (Tübingen, 1984), 187.

Table 5
Geoponika, 10.83: Δένδρον ἄκαρπον καρποφορεῖν. [Ζωροάστρου.]
To make a barren tree bear fruit

1 Συζωσάμενος καὶ ἀνακομβωσάμενος, καὶ λαβὼν πέλεκυν ἢ ἀξίνην, μετὰ θυμοῦ πρόσελθε τῷ δένδρῳ ἐκκόψαι τοῦτο βουλόμενος. **2** προσελθόντος δέ σοί τινος, καὶ παραιτουμένου τὴν τούτου ἀποκοπήν, ὡς ἐγγυητοῦ περὶ τοῦ μέλλοντος καρποῦ γινομένου, δόξον πείθεσθαι καὶ φείδεσθαι τοῦ δένδρου, καὶ εὐφορήσει τοῦ λοιποῦ.	**1** Gird yourself up, grab a hatchet or an axe and approach the tree with a threatening attitude as if intending to chop it down. **2** Let then someone else approach you, begging not to cut it down and promising to be surety for the tree to bear fruit in the future. Give the appearance of being persuaded and spare the tree; it will bear well thereafter.

Note: Zoroaster's name appears as "authority" for a number of chapters in the *Geoponika.* For useful discussion of the pseudo-Zoroastrian traditions, see R. Beck, "Thus Spoke Not Zarathustra: Zoroastrian Pseudepigrapha of the Greco-Roman World," in *A History of Zoroastrianism,* vol. 3 (Leiden, 1991), 491–565.

for the practice of trampling the vintage (*Geopon.,* 6.11), otherwise totally unattested in ancient writings.

It might be noted in passing that we do not have in the *Geoponika* any noticeable evidence for enthusiastic botanical experimentation or introduction of new plants on the scale that one finds, by contrast, in the Islamic world. It would be interesting to know whether and to what extent the literary and intellectual traditions at the disposal of Byzantine aristocrats paralleled the botanical and agricultural innovations known to have emerged from the more widely attested "science" of garden culture in Islamic lands, the more so because we know that the identical literary works of Greco-Roman antiquity from which the *Geoponika* is derived also lay behind the voluminous medieval Arabic literature on farming and gardening.[30]

I have saved till last a look at what the *Geoponika* has to say about garden design and its aesthetic impact. The prologue, addressed to Emperor Constantine VII, speaks of the collection as one where the reader will find matters of pleasure as well as usefulness ("not only necessities but even those exceptional things that contribute solely to the delight of sights and smells"), apparently referring to books 10–12 which deal with gardens, orchards, and flowers. Recognition of sight and smell (alongside usefulness and profit) recur in the somewhat skimpy instructions for garden design found in two specific chapters: 10.1 "The Garden" (παράδεισος) and 12.2 "Garden making" (κηποποιΐα). Table 6 presents the former of

[30] Not even pretending to be representative, I mention only the following: A. M. Watson, *Agricultural Innovation in the Early Islamic World: The Diffusion of Crops and Farm Techniques, 700–1100* (Cambridge, 1983); E. García Sánchez, "Agriculture in Muslim Spain," in *The Legacy of Muslim Spain,* ed. S. K. Jayyusi (Leiden, 1992), 987–99; L. Bolens, *Agronomes andalous du Moyen-Age* (Geneva-Paris, 1981); J. A. C. Greppin, "The Armenians and the Greek *Geoponica,*" *Byzantion* 57 (1987): 46–55; J. F. Habbi, "Testi geoponici classici in siriaco e in arabo," in *Autori classici in lingue del vicino e medio oriente,* ed. G. Fiaccadori (Rome, 1990), 77–92.

Table 6
Geoponika, 10.1: Περὶ παραδείσου. [Φλωρεντίνου]

1 Χρὴ τὸν βουλόμενον παράδεισον ἔχειν ἐπιλέξασθαι τόπον ἐπιτήδειον, εἰ μὲν ἐγχωρεῖ, ἔνδοθεν τῶν ἐποικιῶν. εἰ δὲ μὴ, ἐκ τοῦ σύνεγγυς, ἵνα μὴ μόνον τὰ ἀπὸ τῆς θέας τερπνὰ τοῖς ἔνδοθεν ἀποθεωρῆται, ἀλλὰ καὶ ὁ πέριξ ἀὴρ συναναχρωζόμενος ταῖς ἀπὸ τῶν φυτῶν ἀναφοραῖς ὑγιεινὴν ποιῇ τὴν κτῆσιν. περιβλητέον δὲ αὐτὸν θριγκῷ, ἢ ἑτέρῳ τινὶ ἐπιμελῶς. **2** τὰ δὲ φυτὰ μὴ ἀτάκτως μηδὲ μικτὰ φυτευέσθω, οἷα δή φασι, τῆς τῶν φυτῶν διαφορᾶς εὐπρέπειαν ἐπεισαγούσης, ἀλλὰ κατὰ γένος κεχωρισμένως ἕκαστα τῶν φυτῶν ἐμβαλλέσθω, ἵνα μὴ κατακρατῆται τὰ ἥττω ὑπὸ τῶν κρειττόνων, ἢ καὶ τῆς τροφῆς ἀποστερῆται. **3** τὸ δὲ μεταξὺ τῶν δένδρων πᾶν πληρούσθω ῥόδων καὶ κρίνων καὶ ἴων καὶ κρόκου, ἃ καὶ τῇ ὄψει καὶ τῇ ὀσφρήσει καὶ τῇ χρήσει ἐστὶν ἥδιστα καὶ εὐπροσόδευτα, καὶ ταῖς μελίσσαις ὠφέλιμα. **4** τὰ δὲ φυτὰ ληπτέον ἐξ ἀκμαίων καὶ ἀσινῶν δένδρων. εἰδέναι δὲ χρή, ὡς τὰ ἀπὸ σπέρματος φυτὰ ὡς ἐπὶ πολὺ πάντων τῶν φυτῶν ἐστι χείρονα· βελτίονα δὲ παντὸς φυτοῦ τὰ μοσχεύματα· κρείττονα δὲ τούτων τὰ ἐγκεντριζόμενα, οὐ πρὸς καλλικαρπίαν μόνον, ἀλλὰ καὶ πρὸς πολυκαρπίαν, καὶ ταχεῖαν φορὰν τῶν καρπῶν.	**1** One who wishes to have a garden ought to choose a suitable site,[a] within the farmstead if possible, if not, from the nearby area, so that not only things pleasant to the sight may be observed by those within but also that the surrounding atmosphere may be imbued by contact with plants and thus make the property healthy. The garden should be surrounded by a wall (or fence) or some other structure, as a precaution. **2** The plantings ought to be planted neither irregularly nor intermingled, so to say, although the variety of plants introduces attractiveness. But each of the plants ought to be set out by type, so that the weaker ones not be overcome by the stronger or be deprived of nourishment.[b] **3** The entire space between the trees ought to be filled with roses and lilies and violets and crocus, which are most pleasing to sight and smell and usefulness (medicinal?), as well as profitable (income-producing?) and beneficial to bees. **4** Cuttings are to be taken from thriving and undamaged trees.[c] One ought to know that plants from seed for the most part are inferior to all others. Better in the case of every plant are natural shoots. Of these the stronger/superior are those produced by grafting, not only for beauty of fruit but also for its abundance and swift production of the fruits.

[a]Arab. mentions "near waters if possible."

[b]Arab. mentions "two rows of cypress and other similar trees; put on side of it vines, because cypress trees make vines like cylindrical columns, and so vines will be on top and will grow together to 6 cubits, and then expand to walls and then the space in the middle will be filled and not clear to vision."

[c]Arab. mentions plants "with three heads if possible, otherwise with two heads."

these chapters (10.1), one that corresponds precisely to what was the opening section on orchards and gardening in Anatolius' *Synagoge* (as we can reconstruct it from the Arabic and Syriac versions). In Table 7 we have the latter chapter (12.2), which similarly serves to introduce the section on kitchen gardens (for vegetables and medicinal plants), again its position apparently that given by Anatolius.[31]

The following salient points emerge from these two passages: (1) site relative to the farmstead, enclosed; (2) implied combination of fruit trees, vegetables, and flowers; (3) health

[31] My hesitant probes into the Arabic Yūniyūs (for which I use a photocopy of Teheran Milli 796) have convinced me that this text deserves close and careful study. For access to the Arabic in this text, and for diverse helpful comments, I am grateful to Irfan Shahîd (Georgetown University) and Dmitri Mikulskii (Institute of Oriental Studies, Russian Academy of Sciences, Moscow).

Table 7
Geoponika, 12.2: Περὶ κηποποιΐας. [Φλωρεντίνου]

1 Τὸ τῆς κηποποιΐας χρῆμα ἀναγκαιότατόν ἐστι τῷ βίῳ. κῆπον τοιγαροῦν κατασκευαστέον καὶ πρὸς ὑγείαν, καὶ πρὸς τὰς ἐκ τῶν νόσων ἀναλήψεις, μὴ πόῤῥω τῶν οἴκων, ἀλλὰ ἐκ τοῦ πλησίον, ὥστε καὶ τὴν ἀπὸ τῆς θέας παρέχειν τέρψιν, καὶ τὸ ἀπὸ τῆς εὐπνοίας ἥδιστον· **2** μὴ κατὰ ἄνεμον τῶν ἁλωνίων κείμενον, ἵνα μὴ ἀπὸ τῆς ἄχνης φθείρηται τὰ φυτά. **3** δεῖ δὲ τὸν φιλοτιμησάμενον περὶ τὴν τῶν λαχάνων φυτείαν, πρόνοιαν ποιεῖσθαι σπερμάτων καλῶν, γῆς ἐπιτηδείας, ὕδατος, κόπρου. **4** τὰ μὲν γὰρ καλὰ σπέρματα ὅμοια τὰ ἐξ αὐτῶν ἐσόμενα ποιήσει. ἡ δὲ ἐπιτηδεία γῆ καὶ γονίμη τὸ δοθὲν φυλάξει. τὸ δὲ ὕδωρ διὰ τῆς τροφῆς μείζονα τὰ λάχανα ποιήσει. ἡ δὲ κόπρος χαυνοτέραν ἐργάζεται τὴν γῆν, ὥστε ῥαδίως αὐτὴν ὑποδέχεσθαι τὸ ὕδωρ, ἵνα καὶ ταῖς ῥίζαις διαμερίσῃ, καὶ τὸ φυτὸν ἐκπέμψῃ ἔξω.	**1** Making a garden is essential for life. Now a garden must be prepared—both for one's health and for attacks of illness—not far from dwellings, but in the vicinity, so that it may provide pleasure both from sight and especially from smell. **2** It should not lie downwind of the threshing floor, lest the plants suffer from the chaff.* **3** The person who wants to excel in growing garden plants must take forethought for good seeds, suitable soil, water, and manure. **4** Good seeds will produce offspring like themselves. Suitable and fertile soil will guard what is entrusted to it. Water will make the vegetables grow larger through nurture. Manure makes the soil more friable, so that it receives water more readily, to make space for the roos and to allow the foliage to sprout.

*Cf. Pallad., 1.34.1: Gardens and orchards ought to be close to the house, and located at a good distance from the threshing floor because they are harmed by the dust of the chaff. (*Horti et pomaria domui proxima esse debebunt . . . , ab area longe situs, nam pulverem palearum patitur inimicum.*)

benefits and aesthetic impact; (4) stress on proper culture by plant type; (5) quality of stock. Most of these features are discussed, variously and generally in greater detail, elsewhere in the *Geoponika.* An example would be the specific recommendations for hedges and borders, the advantages of quick-growing ones and the distinction between living plants versus masonry structures (*Geopon.,* 5.44). Anatolius' reason for the summaries here is partly, of course, as a device for starting the books, and that of *Geoponika,* 10.1, is prefatory to the general section of the whole work, which focuses on horticulture.

But there is more to be said. In contrast, for instance, to the hygienic emphasis recurrent in a number of chapters in book 2 (on water supply, unhealthy siting of dwellings), the aesthetic points noted in this chapter are not elaborated elsewhere in the *Geoponika.* It may be going too far to suggest that the writer of the Constantinian prologue in speaking of "things that contribute solely to the delight of sights and smells" has in mind the phrases in these specific chapters that call attention to pleasures of "sight and smell." The reference to sight and smell in *Geoponika,* 10.1, occurs alongside a reference to bee-keeping, and perhaps the production of honey is one of the "profits" of the garden. (The role of bees in pollination was unknown to the Byzantines.)[32] A practical book (such as Anatolius' *Synagoge* had aimed to be) would not likely have dwelt in sentimental vein upon points of aesthetics any

[32] *Geoponika,* book 15, is remarkably sterile compared to the emphasis on bees and apiaries in the Roman agricultural writers.

more than it rehearsed the mythological associations of certain plants. The encyclopedist(s) responsible for putting the *Geoponika* into the form we have it were not so energetic as to search out literary texts—if any existed as such—in which the aesthetics of the garden might have been discussed; nor would they, in the context of their project, have composed afresh on this topic. It is enough, perhaps, to conclude that they gave some continuing prominence to the conventional ideal of garden aesthetic as old as Homer.

These chapters (*Geopon.,* 10.1 and 12.2) exemplify nothing so well as a literary tradition in Greco-Roman agricultural writings, reworked and refashioned over many centuries, and finally encapsulated as we have it in the Constantinian encyclopedia. With some exceptions (a few of which I have discussed above), this statement holds true for the *Geoponika* as a whole. To put it another way, the practical elements sketched in the *Geoponika* represent a "common denominator" of information thought by the tenth-century compilers to be useful to any garden, large or small, owned or worked by any person of any rank in any geographical location. By incorporating in new format certain literary materials inherited from antiquity, the imperial encyclopedists may have been doing little more than fulfilling an antiquarian or preservationist role. The relative unoriginality of their final product makes it easy to dismiss the *Geoponika* in this way and to argue that there is little here of value for those who seek knowledge of patterns and practices current in the tenth century.

Yet we ought again to beware of a facile solution. The *Geoponika,* of course, deserves no small respect as a document and product of its own age. But, more than this, in a sphere so generally conservative as Mediterranean agriculture has always tended to be, it is not unreasonable to suppose that lessons of antiquity were, by and large, held to be of continuing validity in the Byzantine era.[33] The "collections of the ancients" of which the prologue speaks were not, in other words, intended to be perpetuated as mere antiquarian curiosities. We might wish for compilers in the tenth century to have criticized and annotated the late antique texts they were compiling and to have given us precise notions of continuity and change. On the other hand, if horticultural practices and traditions were largely a continuum, tenth-century librarians need not automatically be guilty of compiling a *Geoponika* that contemporaries would have found useless except on the bookshelf. Only a century earlier, Photios had written of an important forerunner in the genre of agricultural literature, "*Useful* is the book [of Anatolius], as *I know through experience.*"

Other scholars can better clarify both the audience that may have read and used the *Geoponika* and the contemporary reality it may reflect. Others, too, will better recognize, identify, and discuss effects that the *Geoponika* may have had in actual Byzantine practice. Fifty manuscripts is a remarkable progeny, so some indeed there must have been. *Geoponika,* 10.85, for instance, instructs on transplanting fully grown, fruit-bearing trees. This precept may in part have inspired the creative energy that Psellos ascribes to Constantine IX.[34]

My conclusion is perhaps disappointing for its lack of originality, but the interest that attaches to the *Geoponika* is not really diminished. An educated readership could appreciate

[33] The conservative tendency of farmers is discussed by Hanson, *The Other Greeks,* esp. chap. 4.

[34] Psellos, *Chronographia,* 173–75, cited by Teall, "Byzantine Agricultural Tradition," 44, and Littlewood, "Gardens of Byzantium," 145.

a convenient and respectably literary book for more than antiquarian amusement. Gardens were made, cultivated, and appreciated by persons of all ranks and for a wide range of purposes. No gardener will rely on books alone, nor should the student of Byzantine gardens expect the *Geoponika* to answer more than its share of questions.

The University of Vermont

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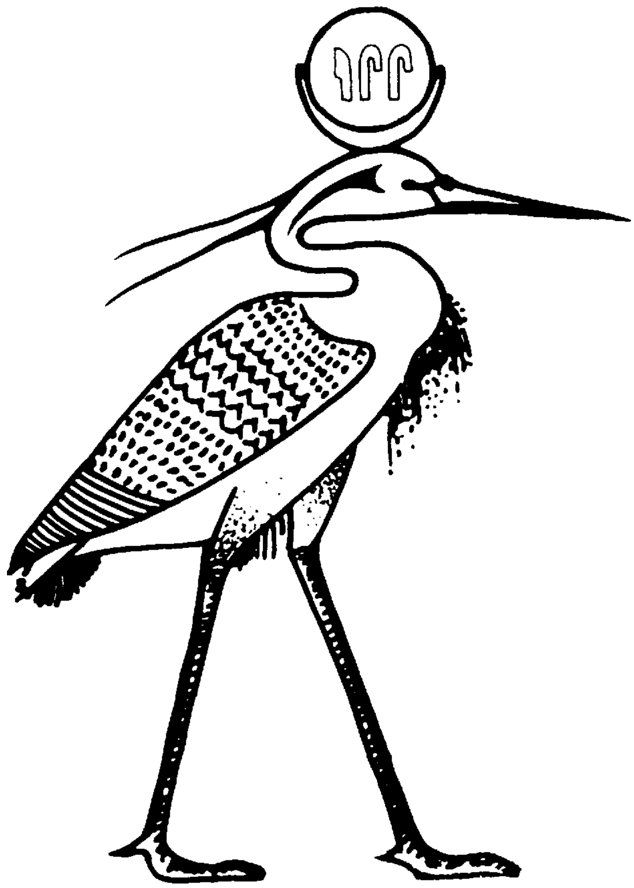

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In This Issue…

Ancient Egyptian Gardens

Jane M. H. Bigelow

Gardens and their requirements are a complex subject. Ancient Egypt has a long and complex history. Combining those two topics produces a subject well beyond the scope of one amateur's paper. The botanical classifications, irrigation techniques, sacred and medicinal uses of plants, all could be separate papers, and some have occupied whole books. This article attempts only a quick overview.

Throughout the history of ancient Egypt, gardens were prized. There were gardens for every purpose, for pleasure and for medicine, for food and for worship. Above all, there were gardens for shade and coolness. Often the same garden served several purposes at once, for the ancient Egyptians were in many ways a practical people. They are credited with having the first botanic gardens. Pharaohs, recording their great deeds, listed gardens they had created and expeditions they had sent to far-off lands for trees and exotic plants. Ordinary people had their own, less elaborate gardens; even poor peasants had their vegetable plots, though these would have been outside of the village. These humble gardeners, or at least the results of their work, were important enough that Horemheb warned his officials not to take the best of the peasants' produce.

If a botanic garden is a collection of specimen plants, then Thutmosis III may have created the first one. His Festival Temple at Karnak contains a room whose walls are decorated with carvings of all the plants which he brought back from his expeditions to Palestine and Syria. They included such exotic plants as iris, calanchoe, and arum, in addition to plants common to both areas, such as palms, pomegranates, lettuces, and melons. So far archaeologists have not found the actual garden.

In many cases, we rely on wall paintings, tomb reliefs, or documents for our information concerning the plants of ancient Egypt. Analysis of pollen grains found in mud bricks from several archaeological sites has provided some information on agricultural crops and on trees (Zahran and Willis 1992:370–375). Plant remains in tombs have also given direct evidence of what trees, flowers, and fruits the ancient Egyptians enjoyed and hoped to have with them in the afterlife.

When a householder in ancient Egypt walked into the garden to enjoy its coolness, what plants would have been in it?

There would have been trees. Even a small urban house would have had at least one if possible. When Nebamun, a police captain of Thutmosis IV, built his house *circa* 1405 BCE he constructed it around two date palms which were already there (Manniche 1989:8). Trees shaded other plants as well as people, shielding them from the full force of the sun. Vines as well as trees shaded pools, making them attractive to wildfowl.

Tomb paintings of private gardens show sycamore fig, *doum* palm, date palm, pomegranates, olives, willows, and *persea*. *Doum* palms have stems divided low down so that the tree seems to have two trunks; each stem bears about forty oval fruits with sweet outer skins and an inner nut containing sweet juice. *Persea* trees are tall trees with oval evergreen leaves; they bear small yellow or green fruit. Wilkinson includes apples in her lists of trees grown in Egypt (Wilkinson 1998:45), as does Manniche (Manniche 1989:117); this is surprising since most apple trees need a chilled period to thrive, and they would certainly not have had it in Egypt at any time. Although temperatures may drop below freezing on occasion, they do not typically stay there. Perhaps gardeners, or garden-owners, regarded the apple trees as a challenge; Pharaohs and their nobles were fond of exotic plants.

Plants in pots would also have been set in the courtyard and along the *façade* of the house of a minor official such as Nebamun. My sources are not clear as to what these plants would have been in small gardens, but in larger gardens such varied plants as cornflowers, and even fig trees, were sometimes planted in mud containers (Wilkinson 1998:26).

Few of the plants would have been entirely ornamental. Even the flower gardens served as a source of offering bouquets, personal ornaments, and party decorations. Flower gardens often included poppies, cornflowers, and mandrakes; sometimes there were hollyhocks and mallows. To judge by wall paintings, the mandrakes seem to have been grown more for their yellow fruits, which contrasted well with the red poppies and blue cornflowers, than for their flowers.

Gardens with pools or canals often had papyrus growing beside them. Flower arranging was an important art; papyrus served to give structure to formal bouquets in addition to supplying blossoms of its own. Such a bouquet would have had a stiff core formed of rushes, palm branches, or papyrus plants. The florist then added cornflowers, water lilies, poppies, and mandrake fruits, tied in tiers to the core. Finally he or she would have covered the bindings with collars made of papyrus (Manniche 1989:24).

If our hypothetical Egyptian had a little more land than Nebamun did, there would have been a fishpond in the garden. It might also contain water lilies, much prized for their beauty and scent. They were the largest, showiest flowers of ancient Egypt, and by far the longest-blooming. Individual blossoms last only a few days, or just one in some species, but the plants bloom most of the year.

The blue spiky flowers being held or worn in so many tomb paintings are probably *Nymphea caerulea*, the blue Egyptian water lily, rather than a true lotus. *Netumbo nucifera*, the sacred lotus of India, probably did not arrive in Egypt before 525 BCE (Ossian 1998:50). Some of the confusion arises because the Egyptian white waterlily has the botanical name *Nymphea lotus;* authors sometimes refer to it simply as a lotus. The white and the blue waterlily are native to Egypt, though more modern agricultural techniques, and the lack of the yearly inundation, have reduced their numbers in modern Egypt.

In many cases there would have been grapevines near the fishpond, sometimes trained over it on a pergola. Grapes were clearly known and cultivated in Old Kingdom times (Wilkinson 1998:44). By the Seventeenth Dynasty Egyptian gardeners had at least four different kinds of grapes available (Huxley 1971:14). If space allowed, there was often a pavilion or kiosk near the pool, shaded by the grapevines. Large estates or royal gardens had several. There the family could sit and enjoy the coolness of the water, and the soothing sounds it made.

Some of the family members may have made their first appearance in the garden. In New Kingdom times, women sometimes gave birth in a bower specially constructed in the garden or on the roof of the house (Robins 1996:83). Sweet-smelling flowers and a structure that allowed cooling breezes to reach her would doubtless have been welcome to the woman in labor.

Ancient Egyptian garden ponds, whether humble fishponds or great lakes fit for rowing statues in ritual processions, all seem to have been square, oblong, or T-shaped. Throughout their long history, Egyptians designed their gardens in what would look to us like a very formal style. Straight lines, square corners, and evenly-spaced rows were the rule, and if that rule was ever broken the record has not reached us. Pits that once contained trees around temples and tombs were dug at precise intervals. Flower and vegetable beds were rectangular, often divided by low dikes. The ancient Egyptians loved symmetry, and twin trees and pools were common.

In part, they may have arranged their gardens in this way for convenience of weeding and watering. The *shaduf,* with its counterweight, first appears in the Eighteenth Dynasty. This hardly made the task of irrigating gardens easy, but before that it must have been incredibly laborious. Every pot or waterskin of water had to be raised from a canal, well, or the Nile itself by pure muscle power. The waterwheel *(saqqiyah)* appears very late, possibly not until Ptolemaic times. Rectilinear beds can have irrigation channels at regular intervals, which means that the laborer need carry water to only a few points. Pottery water pipes were found at the temple palace of Seti I at Thebes, though Wilkinson states that they date from the Late Period. A series of pots with the bottoms knocked out and laid end to end was sometimes used to lead water to plants. The ornamental pots that became popular in the time of Ramesses III would have had to be individually watered, however.

Wells and canals were crucial. Rich Egyptians had their own wells; poor ones had to haul water from a communal well that might be some distance away. Many wall paintings show donkeys laden with large water-jugs. Gardeners performed similar duties, using a yoke to carry two water containers at once.

When the yearly inundation came, Egyptians ran to open the dikes around fields and pools so that the Nile water could flow in. Water stored in the pools would be let out in small, careful amounts to irrigate nearby fields and gardens. Landowners went out to observe the opening of the dikes. A festival celebrating this opening was still being celebrated in the Sixteenth Century CE; people threw flowers, gifts, and even themselves, into the water (Wilkinson 1998:37).

Ancient Egyptian gardens would have been enclosed, either by a reed or thorn fence in the earliest times, or by mud brick walls. These gave privacy and protection from both animals and the wind. Gardeners frequently had to remove sand from gardens even so. They had to guard against insects, snakes, goats, monkeys, baboons, and even hippopotami. (It makes this gardener inclined to complain less about squirrels!) Baboons are sometimes shown helping with the fruit harvest; unlikely though this seems, it was evidently also done in Malaysia in modern times (Hyams 1971:14).

Most gardens, including some temple gardens, had vegetable beds. These often had low mud walls around them to keep the water near the plants, and were sited near water. This is advisable for any dry-climate garden, but especially for vegetable gardens. The cucumbers and melons planted there need large quantities of water to produce good crops, as does lettuce. Lettuce was sacred to the fertility god Min, and was thought to be aphrodisiac. Onions seem to have been everywhere. Along with garlic and radishes, they were a staple of the Egyptian diet. If Manniche is right, and the ancient Egyptians did not have herbal tooth powders (Manniche 1989:44), then perhaps it is no wonder that they set such value on perfume and incense.

Royal and temple gardens had more scope than those of private individuals, and more demands on them. Avenues of trees, such as tamarisks and sycamore figs, were planted along the approach to temples. Tamarisks were commonly used along the approach to tombs and temples because people believed that the sky goddess Nut gave birth to the deceased king in a grove of tamarisks. Sycamore figs (which, by the way, have nothing to do with the sycamore trees we see in our parks and gardens) were sacred to Nut, who gave nourishment to the deceased; sometimes the goddess of the sycamore is identified as Hathor or Isis instead. Hyams (1971:13, 15) holds that all trees were sacred in Egypt, and that the large variety of imported exotics made it possible for each temple to have its own sacred species. Certainly sacred groves were important. There were avenues of trees along the approaches to temples in early dynastic times. Akhenaten, for all his radical changes, began making gardens and groves as soon as he began his new city of Akhetaten.

Growing trees near many of the temples required heroic efforts. Thutmosis III built a shrine near Hatshepsut's temple at Deir el-Bahri; in order to grow trees in that inhospitable territory the officials in charge had to have pits dug ten meters into the rock. The pits were then filled with fertile Nile mud.

Some of the transplanted trees came from other countries. Hatshepsut sent an expedition to Punt to bring back incense trees, possibly for her temple at Deir el-Bahari. Her workers dug them up with their root balls intact—or nearly so— transported them in wicker baskets aboard ship, and planted them in pits, or possibly in pots. All but one survived the journey, according to Huxley (1978:139). Wilkinson, however, says that "there are three problems to do with the trees from Punt: the location of Punt, the identification of the trees brought from Punt, and where the trees were indeed planted" (Wilkinson 1998:84). With modern analysis, we can often identify even fragmentary plant remains, but no trace of Hatshepsut's trees has been found.

The experiment may not have been a success. Thutmosis III also went to Punt to bring back incense trees. Had the earlier shipment died, or was he proving that he was at least as good as Hatshepsut at absolutely everything? In their native habitat in Oman, frankincense trees are watered by a heavy dew during the monsoon season. Anyone who has tried to grow moist-climate plants in an arid or even semi-arid climate has discovered that sometimes, no matter how much water the gardener supplies, the transplant withers for lack of humidity. Sometimes sheltering the plants behind walls or massing several specimens close together will save them, and sometimes not.

History does not record what Akhenaten's gardeners thought of his choice of site for his new city, Akhetaten. Desolate, wind-swept, and subject to temperature extremes, it would have been a challenge even if the gardeners and architects had been given plenty of time. While Akhenaten and his court waited for the transplants to grow, painted and tiled walls gave promise of what was to be.

Transplants are particularly vulnerable to dehydration. How did Akhenaten's gardeners keep alive what must have been hundreds of trees? Pools figure largely in the gardening landscape of Amarna; perhaps some of them were not entirely ornamental. Cornflowers, poppies, mandrakes, and hollyhocks could all have been grown from seed, though the seedlings must have been given some shelter from sun and wind.

Before, during, and after Akhenaten, officials and nobles had their tomb gardens. We can tell a lot about actual tomb gardens from the painted representations and small models that have survived. Some officials left detailed descriptions of their tomb gardens. Ineni, who designed gardens for both Thutmosis I and Hatshepsut, was one who did so. As befits someone of his importance, it was quite large and contained "73 sycamore trees; 31 persea trees; 170 date palms; 120 *doum* palms; 5 fig trees; 2 moringa trees; 12 vines; 5 pomegranate trees; 16 carob trees; 5 Christ thorn; 1 argun palm; 8 willow trees; 10 tamarisk trees; 5 *twn*-trees (a kind of acacia?); 2 myrtle (?)...and 5 unidentified kinds of tree" (Manniche 1989:10).

Lesser personages would have had at least one sycamore fig for the sky goddess Nut to inhabit. She would care for the tomb-owner in the hereafter, bringing him gifts and nourishing him. Tomb paintings often show a pool with water lilies, papyrus, ducks, and fish. On the edge of it, the tomb owner would have arranged for someone to grow the same poppies, cornflowers, and mandrakes that he or she enjoyed in this life.

Most herbs are not terribly demanding in their cultural requirements. They need plenty of light (no problem in Egypt), warmth (also no problem), and moderate amounts of water (Egyptians knew how to provide this, and still do). There were herbs for medicine, herbs for cooking, herbs for cosmetics; sometimes the same herb served all three purposes. Temples had entire gardens devoted to medicinal herbs. Manniche lists 95 medicinal plants in *An Ancient Egyptian Herbal* (1989:64–158). Some are still in use today, such as senna, an extract from any of several species of *Cassia*. These are small, shrubby trees, whose bark is similar to cinnamon. The upper classes used it as a laxative, while humbler sufferers had to make do with a mixture of castor oil and beer (Mann 1992:8). Extracts of willow bark and leaves, which contained salicyl, were used to treat inflammation and rheumatic complaints. We use it today when we take an aspirin tablet. We have, however, eliminated prescriptions which call for hippopotamus dung.

The ancient Egyptians created and maintained these gardens with few tools. It is hard to imagine gardening without some kind of hoe. Theirs were sometimes all wooden, and in predynastic times were just forked sticks with sharpened points (Huxley 1978:107). Some had copper blades (Wilkinson 1998:31).

They carried soil and sand in baskets, and used scoops to move mud. Curiously, I have found no mention of shovels. Indeed, Wilkinson says flatly that "tools were limited to ploughs and Egyptian hoes for digging" (Wilkinson 1998:31).

The gardeners who did the actual labor had a rough life. With these few tools, they had to create and maintain the networks of dikes and water channels that directed water to the plants and kept it there. They had to remove windblown sand and spread manure, remove weeds and bring in water. When all that was done, one gardener's contract required him to make baskets in the evening.

Those laborers were toiling away at the beginning of garden history. Elements of Egyptian garden design recur throughout the millennia, transmitted through the Greeks and Romans. Eighteenth Century CE European gentry would have found much of an Eighteenth Dynasty garden familiar and pleasing. Modern public gardens, while less rigidly rectilinear, use terraces and pools in ways

the ancient Egyptian would have recognized. Surely they would have enjoyed our formal rose gardens with their neat rows and abundant scent.

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ALIX WILKINSON

SYMBOLISM AND DESIGN IN ANCIENT EGYPTIAN GARDENS

Ancient Egyptian gardens were constructed with many of the features known now from later gardens. But the designers were motivated by religious considerations which dictated the form of the gardens and what plants were used in them.

MEANING, FUNCTION AND FORM

In the creation of gardens, as in the creation of language, three elements are involved: meaning, function, and form. Form is universal: the designer of a garden has to take account of the extent and gradients of the space chosen, and devise a layout. Function, which is the use made of a garden, varies with the status and needs of the owner. The garden may be a place for growing particular plants, or it may be designed to accommodate great crowds, or it may be a space for a few people, or even just one, to sit and enjoy its sights and sounds. Meaning is the philosophy behind the creation of the garden. It can be expressed in statuary, layout, inscriptions, and in the plants, which have significance for the people of the time. Form and function are constant in garden making; meaning was important in earlier centuries. The Countess of Bedford laid out her garden at Twickenham Park in the form of the pre-Copernican universe.[1] Vicino Orsini in the sixteenth century represented his autobiography in statuary in his garden at Bomarzo.[2] The seventeenth-century labyrinth at Versailles held its own secret message.[3] Loudon, in the nineteenth century, believed that landscape gardeners could improve the moral feelings of the visitor.[4] Gardens were created which told a story, such as Bunyan's *Pilgrim's Progress*,[5] or the journey from birth to death.[6] Plants,[7] symbolic of various human qualities were used in the Medieval and Renaissance periods.[8] In the latter part of the twentieth century in the West, symbolism[9] has largely been absent,[10] except in the work of such designers as Sir Geoffrey Jellicoe,[11] or as a way of creating atmosphere, although recently a series of essays has been devoted to the meaning of gardens.[12]

INTRODUCTION TO MEANING, FUNCTION, AND FORM IN ANCIENT EGYPTIAN GARDENS

Ancient Egyptian gardens were designed with all three elements, meaning, function, and form in mind. Function, entwined with meaning, dictated form.

The difference between the ancient Egyptian and modern landscapists is that the Egyptians began from the mystical properties of a particular place. Every spot they

7 Tenniel Close, London W2 3LE

selected for a sacred building was where a deity was believed to reside. They also re-created the characteristics of the place where some mythological event had happened, by adding architectural and plant features which would be reminders of the myth. These myths were about the creation of the world, the after-life, and about the lives of the gods. The Egyptians were not searching to impose meaning, in the manner of those who created a park in Mexico City as a cultural reminder of the lost city of Tenochititlan.[13] Nor were they like the English garden designers of the eighteenth century who used classical mythology and their Gothic heritage as the language of their buildings and statuary, as, for example, at Rousham.[14] Meaning was already there, and understood. They were more in the spirit of Henry Hoare, who, at Stourhead, whether playfully or not, acknowledged the water deities of the site and compared the foundation of his dynastic home with Aeneas's foundation of Rome, as interpreted by Virgil.[15]

In Egypt, the territory in which a garden was planted already had its own significance and resident deities. Thus the goddess Hathor was believed to dwell in the mountain chain which ran from Deir el Bahari to Deir el Medineh. Shrines dedicated to her were built over the years at each end of the range, north and south. At Karnak, across the river, the gods, Mont, a falcon-headed war god, and Amun, called the 'Hidden One', already inhabited the site on which the temples and gardens were built.

A garden mirrored the features of a mythological landscape, and of the world of the after-life. This landscape had to be as permanent as possible, and sustainable by future generations. It was a marvel which would impress the priests and courtiers who would understand the symbolism, and amaze the general populace and foreigners who would be awed by the size and splendour of the buildings and their grounds. The palaces in which the kings lived were also sacred precincts, because the king was himself a god. Palace gardens were the setting for the ceremonial reception of foreign ambassadors as well as for the entertainment of the king and the court.

Tomb gardens were intended to be places where the soul of the dead could find rest and refreshment. The form which resulted from these requirements was a courtyard filled with trees, under which stood a basin of water for the soul, as bird or human, to drink.

MEANING

The symbolism of temple gardens

Meaning was fundamental to Egyptian architecture and garden design. The design of temple gardens depended on whether they were the cult temple, where the images of the living gods resided, or were funerary, and were intended for occasional use. Gardens were an integral part of the cult shrine, which was itself a cosmos, representing both Egypt and the universe.[16] Temple gardens incorporated water, which represented the original water which covered the earth at the beginning of time, and was the god called Nun, and the vegetation which grew around and in it.

The plants grown in these gardens all had their own symbolism. The waterlilies (*Nymphaea lotus*, *Nymphaea caerulea*) floating on the lakes were reminders that the sun god had originally sprung from the waterlily,[17] and papyrus (*Cyperus papyrus*) was the home of Hathor,[18] the sky, and mother goddess, and was also the place where Isis had hidden her son, Horus, after the murder of Osiris, her husband, by his brother, Seth. Palms were sacred to the gods of the sun, moon, and fertility.[19] Date palms (*Phoenix dactylifera*) were particularly connected with the sun god, doum palms (*Hyphaene

thebaica) with the scribe of the gods, Thoth, and with Min, the fertility god. Another of Min's plants was the humble lettuce (*Latuca sativa*).[20]

The symbolism of tomb gardens

Tombs were based on the design of the tomb of the god, Osiris, who had been restored from death to life. By imitative magic, the human dead could enter eternal life by being buried in a tomb like that of Osiris. This tomb consisted of a mound of earth with trees around it, enclosing a tomb chamber (Figure 1). An actual realization of this concept was made at Abydos by King Seti I. It is a temple-like structure on an island, with a tomb beside it, buried under a great mound of earth and sand. Around the mound were planted conifers and tamarisks in six, huge brick-lined pits. A tamarisk was believed to be the place where the soul of the god, Osiris, in the form of a bird, rested (Figure 2). It was also believed to be where the king as the sun was reborn.[21] According to the solar myths, the dead king became the sun, which the sky goddess swallowed each night and gave birth to each dawn. King Mentuhotep (*c.* 2010–1960 B.C.) planted tamarisks (*Tamarix articulata*) and sycomore-fig trees (*Ficus sycomorus*) in front of his tomb and funerary temple at Deir el Bahari (Figure 3). Sycomore-fig trees were the home of the sky-goddess, called alternatively, Hathor, Nut, and Isis. On the eastern horizon of heaven, the sun emerged between sycomore-figs of turquoise.[22] The sycomore tree had another role, as nourisher of the deceased (see Figure 8). In paintings in courtiers' tombs, the sky-goddess appears from the sycomore-fig tree at the corner of a pool, holding out bread and fruit and pouring water. Mentuhotep thus made sure that the two trees significant for his rebirth as the sun were beside his tomb. Date palms represented the sun, and had the practical advantage of being able to withstand drought. Single palm trees and flowerbeds were planted in the open courtyards of priests' and courtiers' tombs at Memphis and Thebes.

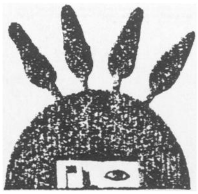

Figure 1. Illustration of the tomb of the god Osiris within a mound. On the coffin of Petosiris in Marseilles

Source: Jacques Vandier. Manuel d'archéologie égyptienne *(Picard, Paris, 1952–69), fig. 319*

The meaning and message of the gardens was frequently in the sculpture, both in the round and in relief, which represented the owner in various guises and performing various activities. The sculptures intimated things historical and mythological. The things historical were the relation of the owner to his ancestors, and the things mythological were about the relationship of the owner to the gods. The owner appeared in various guises, and performed various activities, both in sculpture in the round and in scenes of relief. In tomb gardens, a statue represented the owner himself. It was the living presence of the deceased, and had to receive the attention and respect due to him. Over life-size figures of Mentuhotep stood in front of the avenue at his funerary temple at Deir el Bahari. They were fixed into the rock by means of deep pedestals which were buried in the rock. Lion-bodied sphinxes, with the face of Queen Hatshepsut, lined the way across the lowest terrace of her funerary temple beside that of Mentuhotep at Deir el Bahari.

The status of the owner is demonstrated by the size of the garden and its enclosure, and by the size and splendour of the buildings and their decoration. Royal gardens were much larger than those of anyone else: Mentuhotep's grove at Deir el Bahari was about 50 m square: a garden at el-Amarana covered an area of about a length of 196 m.

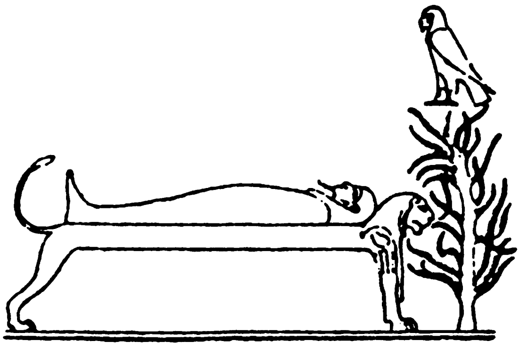

Figure 2. The soul of Osiris in the form of a bird perched in a tamarisk. In the temple of Hathor at Dendera

Source: Jacques Vandier, Manuel d'archéologie égyptienne *(Picard, Paris, 1952–69), fig. 319*

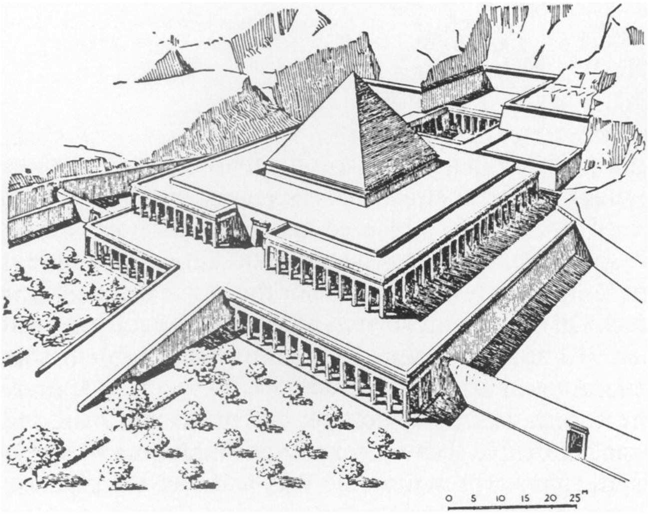

Figure 3. Reconstruction of the trees in front of Mentuhotep's funerary temple

Source: E. Baldwin Smith, Egyptian Architecture as a cultural expression *(New York, 1938)*

The royal dominance over nature is demonstrated by bringing plants into the desert, rather than by draining areas of marsh, as for example, at Versailles, or carving out a clearing in a forest.

Summary

Temples were not, as in eighteenth-century Europe, 'trifles best seen by chance'.[23] but the main building, and *raison d'être* of the garden. Statuary and sculpture were not just decorative features. They were bearers of religious as well as political messages.

FUNCTION

The function of temple gardens was to produce the floral, vegetable, and fruit offerings needed for the rituals of the gods, as well as for the perfumes used for anointing the statues, and to provision the staff of priests and workpeople in the temple.[24] Hatshepsut and some of her successors tried to grow incense trees, *Commifora myrrha*, and possibly *Boswellia sacra*, in their gardens.[25] Hatshepsut said she brought 'green *anty*' trees from Punt (Figure 4). 'Green *anty*' has been identified both with myrrh[26] and with frankincense. The space provided by gardens was used for processions within the temple

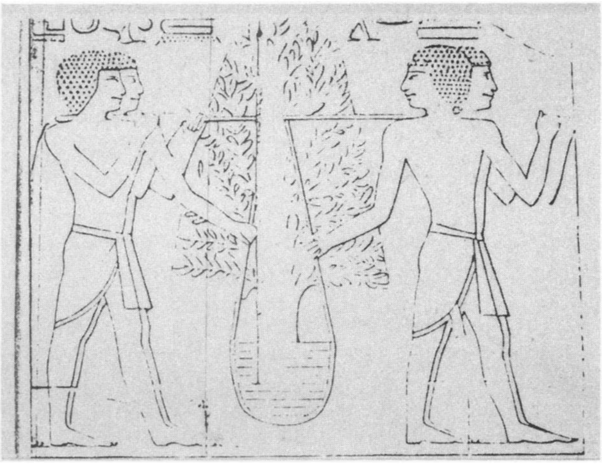

Figure 4. Incense trees brought to Egypt from Punt
Source: Edouard Naville, The Temple of Deir el Bahari *(London, 1894–1908),* III

enclosure, and had to accommodate large gatherings of priests and attendants. At Amarna there was a walled park-like area, called *Maru-Aten*, which may have been an open-air temple. It had a central lake, surrounded by temples and other buildings. This enclosure may have represented earth, and on the lake, oriented east–west, the route of the sun could have been enacted with a boat rowing between a small temple and a jetty.

The avenues between temples formed the processional route for festivals, such as at New Year,[27] or the Feast of Opet, when the statues of the national deities inhabiting the temple of Karnak, Amun, Mut, and Khonsu, were carried by priests, accompanied by an excited throng, to the Luxor temple. At the Festival of the Valley,[28] the gods of Karnak sailed across the river, so that the statues of the 'living gods' could visit the 'dead gods' in the funerary temples on the west bank of the Nile. In order to reach Hatshepsut's temple at Deir el Bahari the procession would go from her riverside Valley Temple, which was probably also surrounded by trees,[29] along a tree-lined canal to her funerary temple.

Menageries were included in gardens. Live animals in the royal gardens reflected the king's ambition to collect the living world around him, and to have animals of particular significance as his attendants. Lions, the royal animal *par excellence*, decorated his throne and chariot. Lions were kept in cages at the entrance to royal gardens at Karnak (see Figure 12), and antelopes, oryx, and ibex were kept at Karnak and Amarna. Aviaries were probably part of the garden design at Amarna in the 'Northern *Maru*'. Birds illustrated at Amarna, and presumably living in the gardens, included rock pigeon, turtle dove, great spotted cuckoo, grey-lag goose, pied kingfishers, geese, and ducks. Ducks and geese were ornaments as well as being edible, as were the fish. Animals were bred at various temples. Some were the animals sacred to the deity of the temples, such as rams at Mendes and Elephantine, bulls at Memphis, Bubastis, and Akhmim, and pigs at Memphis. Others were needed for the offerings in the temple. During the Old Kingdom (2600–2150 B.C.) birds were reared at the sun temple of Niuserre. Kings arranged for the construction of fowl-yards in the temple of Amun at Karnak. Seti II said the temple was, 'filled with geese, cranes, ducks, doves and [other kinds of fowl] to provide the divine offerings for his father Amun'. In the later periods, they were reared so that pilgrims could offer them as sacrifices to the deity of the temple. Mummified ibises, have been found in huge numbers at Saqqara, Hermopolis, Athribis, and Abydos, and cats, apes,

and crocodiles, at Tuna el Gebel, Mareotis, and in the Fayum. Shrines of the crocodile god, Sobek, are illustrated from the Old Kingdom up to the Ptolemaic period. Temples of Sobek are known at several places including Kom Ombo, Edfu, and Hermonthis (Armant), where the water-pen for the crocodiles had a movable hatch through which they were fed.

The function of temple gardens was to provide floral, vegetable, and animal offerings and provisions, whereas the function of tomb gardens was to be available to the spirit of the deceased as a place of shade and refreshment, and to that end they were often illustrated on the walls inside the tomb. The external garden was the place to which relatives and priests could bring water and offerings for the spirit of the deceased.

FORM

Garden design in general

Since they are at the beginning of the story of garden-making, and set the agenda in form for gardens throughout the Near East and beyond, ancient Egyptian gardens have many of the features well known from later times. The glory of gardens depends on their design, on the way they are laid out and structured, and on the decorative features, skilfully placed to enhance a view or evoke ideas. After these foundations have been laid, the planting brings colour, light, and shade, and variations in height. Ancient Egyptian gardens were no exception.

Egyptian gardens were formal.[30] They were axially planned, as for example, Hatshepsut's funerary temple at Deir el Bahari which was approached by a series of rising courtyards. A building, whether tomb or shrine, was the focus and point of departure. The unity of the building and the gardens was usually evident. Straight lines predominated in the design and in the plantings. Symmetry is found in the repetition of like with like. For example, twin groves, twin trees, and twin pools. Geometry is exemplified in the arrangement of rectangles within a garden. In the illustration which survives of a garden at Karnak, the layout consists of a rectangular walled area in the centre of which is a vineyard (Figure 5) surrounded by walled gardens, some of which are orchards, and some of which have pools and a shrine. Identical trees were planted in avenues at the funerary temple of Mentuhotep at Deir el Bahari, and on the approach to the temple of Karnak, where there was an avenue of sycomore-fig trees, underplanted with vines and papyrus (Figure 6).

Elements of the designs

Gardens were laid out with a strong structure, making use of different levels linked by terraces, and often centred around pools of water. Steps and stairways emphasized changes in levels and viewpoint. Terraces, which 'can be the supreme expression of garden art',[31] had balustrades supporting the steps linking the different levels, as, for example, at Queen Hatshepsut's temple at Deir el Bahari. Trees were grown on the lowest terrace.[32] At the bottom of the ramp, around the papyrus pools were about 66 pits cut in the rock, probably for flowerbeds,[33] rather than for the incense trees brought from Punt.[34] It is not certain where these were planted. The garden of the 'King's House' at Amarna was terraced,[35] as is an estate at Karnak (see Figure 12).

Areas with their own individuality were separated by walls or trees. Within these areas, arcades and colonnades provided a variety of textures and a background for plants.

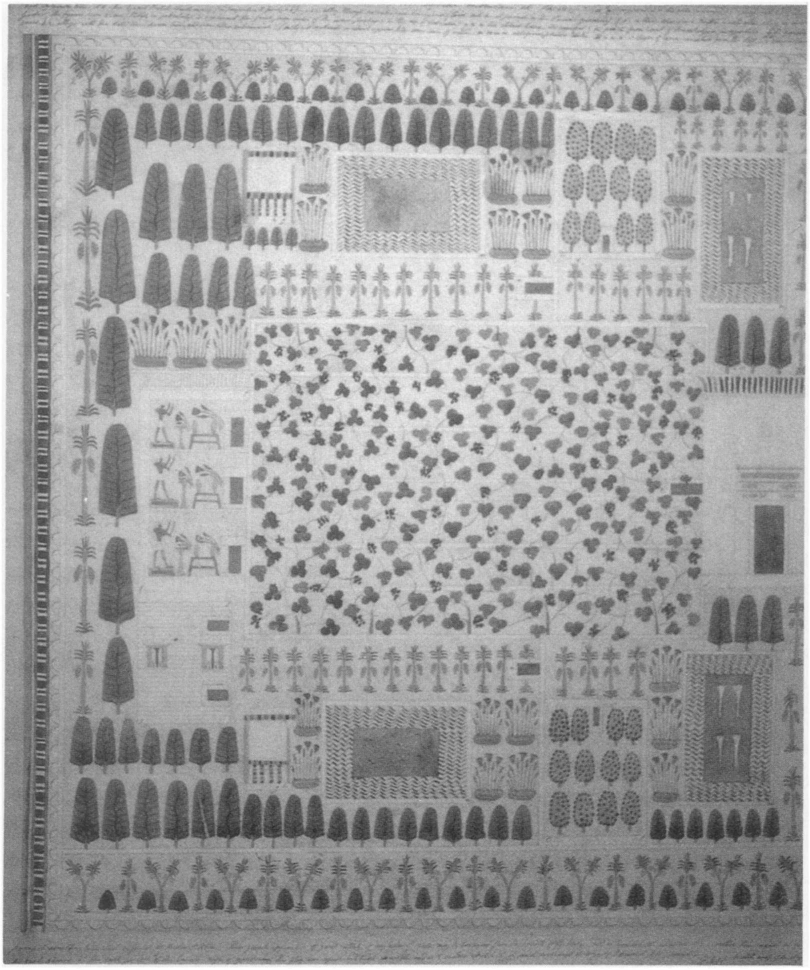

Figure 5. The garden illustrated in the tomb of Sennufer TT 96. Painting made by Dr Ricci for Henry Salt. *Courtesy of the Trustees of the British Museum*
Photo: author

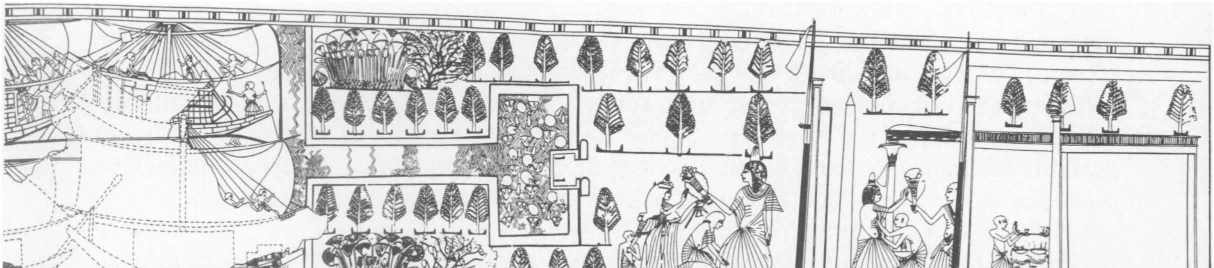

Figure 6. The approach to the temple of Karnak.
Source: Norman de Garis Davies, The Tomb of Nefer-Hotep at Thebes *(New York, 1948)*

Sunken *atrium* gardens inside buildings have been found in excavations in four ceremonial areas at Amarna: in the 'central palace', inside garden buildings in the open air temple, the *Maru-Aten*, in the 'Northern Maru', and at the site to the south of the city, called Kom el Nana. Courts with pools and flowers around them beside dining rooms and bedrooms in the palace at Amarna are illustrated in several officials' tombs (Figure 9). These floral representations may be painted pavements, actual examples of which were found at Amarna.

Vistas were controlled by avenues, and concentrated the eye on a particular view. From the funerary temples on the west bank at Thebes , the vistas converged on the Nile, and beyond it on the temple of Karnak. Equally, a procession leaving Karnak would have its sights set on the temples at Deir el Bahari.

Constituents within a garden

Water was the central feature of many gardens. The temple lake was not only the water source for the temple, but was the place where rituals were performed, such as taking the statue of the deity out in a boat. On the pathway beside the lake, processions passed on various festivals such as for the Burial of Osiris at Karnak.[36] Some temple lakes were very large, the one at Karnak measured 132 by 80 m. The lake in the *Maru-Aten*, at Amarna was 120 m by 60 m. Other temple-lakes were smaller: 33 m by 28 m at Dendera, or 18 m by 20 m at the Eighteenth-Dynasty temple at Medinet Habu. The king was rowed on a lake in a special barge as part of a religious ceremony,[37] and after his death his statue was rowed out on memorial days.[38] Private gardens sometimes contained lakes. Officials described the extensive lakes on their properties,[39] and a lake large enough for a boat to travel on is illustrated beside *D*hutnufer's house (Theban Tomb 80). People valued pools as sources of refreshment and coolness. In them they bred fish and birds for food. There were also cisterns, which stored water for supplying the plants in the gardens. Pools were stepped, so that the water could be reached when the pool was nearly dry (Figure 7). The edges of some pools provided terraces for marsh plants. The shapes of pools were rectangular and T-shaped. The T-shape was the form in which the channels in front of temples were arranged as landing areas. The T-shape also reflects the form of a place where offerings were made (Figure 8). It is this meaning which explains the shape of the pools beside the ramps in the courtyard of Hatshepsut's temple at Deir el Bahari. These pools were filled with growing papyrus, indicating the point where the goddess Hathor, as a cow, appeared out of the mountain.

One of the features illustrated in the wall-paintings is a ceremonial landing platform surrounded by a low balustrade. An actual platform was found at the temple of Ramesses III, at Medinet Habu, jutting out into the pool in front of the temple gateway. These platforms foreshadow the lakeside jetties still remaining in Moghul gardens.[40] Bridges have not survived, but a long, stone-built quay was found jutting out into the lake at Amarna, in the *Maru-Aten*.[41] Such a jetty remains in the Shalamar garden at Lahore. Water was brought in canals to feed the gardens, and was a feature around which a garden was created. A pond marked a focus of interest, sometimes a garden kiosk was set beside it (see Figure 5).

Buildings in gardens were the dwelling of gods, whether they were magnificent stone temples covering several acres, like the temple of Amun at Karnak, or small, stucco-covered brick shrines in the gardens of private houses. Buildings could simply be bowers made out of papyrus, or pleasure pavilions providing shade and somewhere to sit,

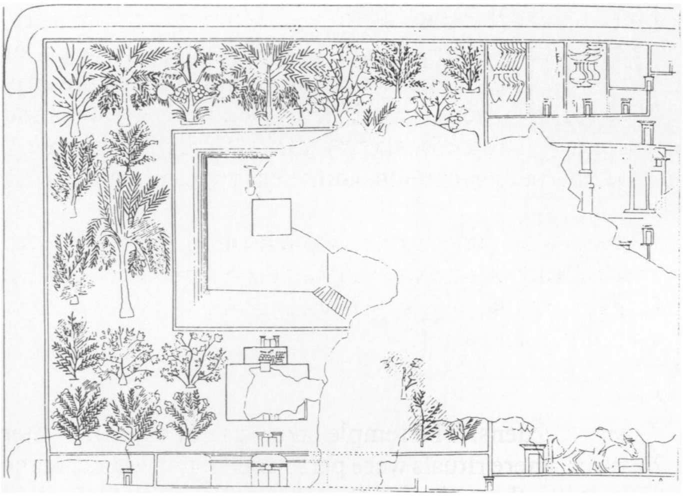

Figure 7. Cistern with stepped sides in an orchard. Relief in the tomb of Meryre at Amarna
Source: Norman de Garis Davies, The Rock Tombs of El Amarna *(London, 1903–08)*

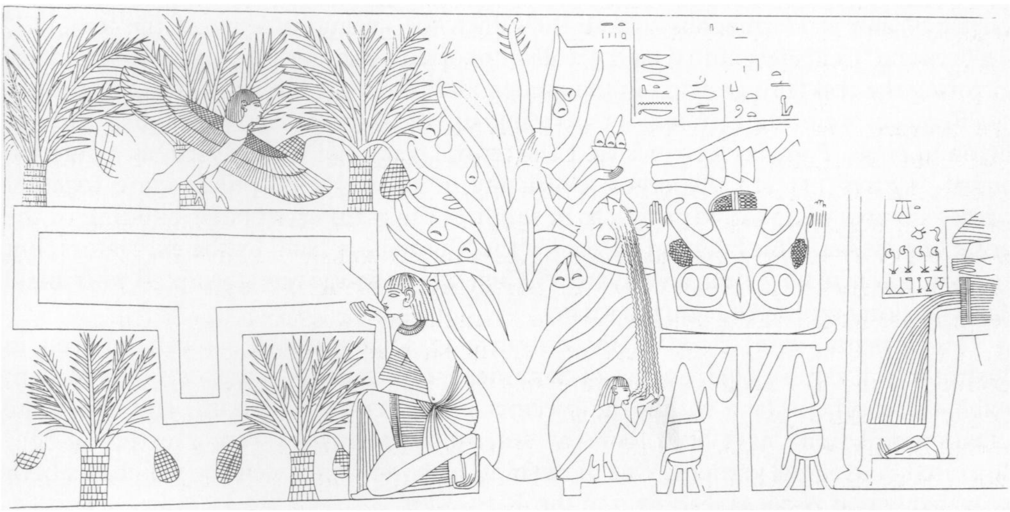

Figure 8. T-shaped pool painted in the tomb of Tjanefer. Theban Tomb 158
Source: Keith Seele, The Tomb of Tjanefer *(Chicago, 1959) pl. 11. Courtesy of the Oriental Institute of the University of Chicago*

or make love,[42] or give birth.[43] Such garden pavilions survived in Cairene gardens until at least the time of Napoleon's expedition (Figure 10). Shrines along the route between the Karnak and Luxor temples on the east bank of the Nile were surrounded by their own gardens. The route itself, by the time of the Thirtieth Dynasty, was 'a magnificent avenue enclosed within walls planted with trees made dazzling with flowers'[44] and lined with recumbent stone sphinxes. The pits for the trees, the canal and the sphinxes have been found in excavation.[45]

Excavations show that gardens were usually walled. High, plastered walls, sometimes with painted or tile decoration, hid the participants taking part in processions from the stares of the vulgar. Painted and tiled walls in gardens continued up to the eighteenth

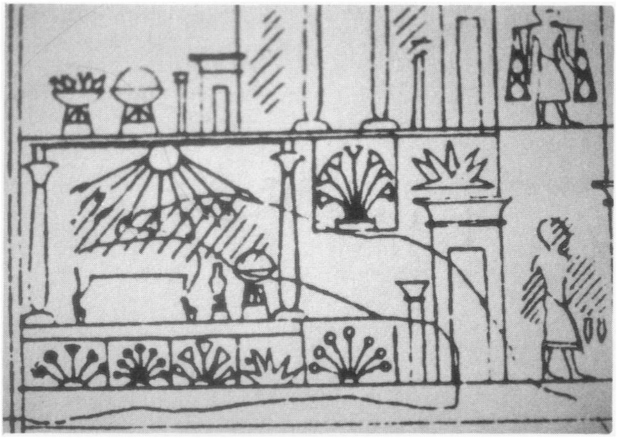

Figure 9. The royal couch beside flowerbeds. Over the bed, the many-handed sun spreads out over the canopy. Relief in the tomb of Parennefer

Source: Norman de Garis Davies, The Rock Tombs of El Amarna *(London, 1903–08)*

century in Portugal.[46] Sometimes walls were serpentine (sinuous)[47] and may have provided protective surfaces for growing fruit trees. Serpentine walls have been found at Karnak,[48] and at Hermopolis, where they lined the avenue in front of the temple.[49] Trellises and 'treillage' painted on the walls supported tempting vines and pomegranates mirroring the real fruit growing in the garden and providing a kind of *trompe l'oeil.*

Pergolas were another way of dividing up the garden, and were also used to surround pools. Pergolas for vines were the central feature of several gardens painted in tombs (Figures 11, 12). A pergola consisting of square brick pillars close together covered an area of about 70 m by 120 m south of the main ceremonial building in the centre of Amarna. This building was called the 'Coronation Hall' by the excavators, but it is more likely to have been a vineyard.[50] The walls or floors were decorated with inlaid tiles with floral motifs and aquatic scenes.

Monumental gates stood at the entrance to some gardens, as can be seen in illustrations in tombs, such as that of Sennufer (see Figure 5). Gateposts of a garden, which surrounded a lake within the precinct of the temple of Amun, and called the 'Libation of Amun', have been found at Karnak.[51] Gatehouses were a feature of both illustrated, and actual gardens. One of the most elaborate and extensive which has been excavated was at Amarna leading into the *Maru-Aten.*

A sacred tree, or grove of trees, was grown in its own enclosure in some temples, such as at the temple of Hermopolis during the Middle Kingdom, or in Ptolemaic times, at Medamud. A special tree was given prominence in others, as in the funerary temple of Mentuhotep at Deir el Bahari, where a particular sycomore-fig sheltered an altar and a statue of the king. There was a grove of sycomore-fig trees, sacred to the goddess Hathor, at Deir el Medineh. Each tree was planted in its own container, or in a pit, so that it could be individually watered. At temples up and down the river, trees were brought into the courtyards, enhancing the stone-imitative plant elements with natural vegetation. Inside the court of the Roman temple of Khnum at Elephantine, real palm trees grew up in front of stone imitations of papyrus, lotus, and palms.[52]

The terrain in which gardens were made

In order to create these magnificent gardens the Egyptian designers had to deal with two potentially overwhelming elements: the desert and the river. In the desert there was too

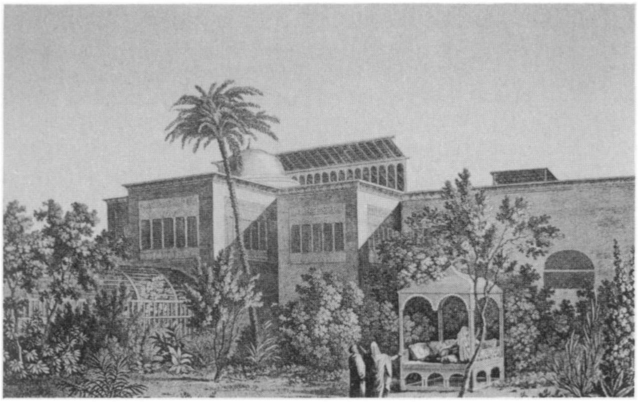

Figure 10. Pavilion in the garden of Elfy Bey

Source: Description de l'Egypte, *1 (Réédition Michel Sidhom, Paris, 1990).*

Figure 11. Vineyard in the garden of the palace of the Queen of Pharaoh Ay

Source: Norman de Garis Davies, The Tomb of Nefer Hotep at Thebes *(New York, 1933)*

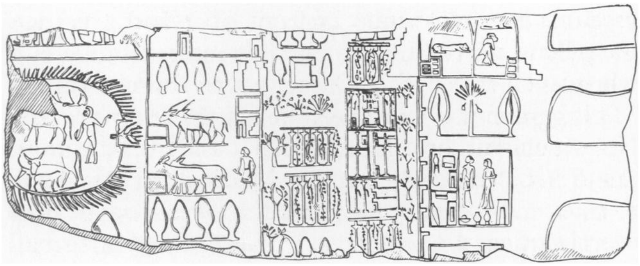

Figure 12. An estate at Karnak with lions' cages, a gatehouse, a vineyard, trees and an animal enclosure illustrated on a relief block

Source: P. Anus, Bulletin de l'Institut Français d'Archéologie Orientale 69 *(1970)*

little vegetation; and along the river bank there was too much. On the slopes of the western mountain at Thebes, the architects were trying to extend the river bank into the desert, and had to do it by artificially providing water. This mountain was the site of the royal funerary temples and courtiers' tombs. Here the dead rested 'Upon the Crag of the Lady who is the West of Thebes'.[53] This was seen by the Egyptians as a hard, hilly desert, scattered with the round-topped markers of many tombs, with somewhere a lush

papyrus marsh were poppies also grew, into which the sky goddess, as a cow, stepped to welcome the dead, who were inside their tombs in the tall, pink rock beside these markers.[54]

Landscape of the west bank at Thebes

The Egyptians created buildings and gardens which were integrated with the surrounding natural scenery. The royal funerary temples were ranged along the hillside with their backs to the mountain and their gardens stretching down into the plain. This layout is the same as that at the Taj Mahal which also has the tomb-pavilion at one end of the central axis.[55] During the Eighteenth Dynasty, the gardens formed terraces of trees against the desert mountain backdrop. Sycomore-fig and *Mimusops laurifolia* grew below Hatshepsut's great funerary temple in deep pits cut in the rock. Date and doum palms stood in individual courtyards of the private tombs on the lower slopes of the hillside during the Eighteenth and Twenty-Sixth Dynasties. The decoration on the walls of some of these courts shows that trees and flowers were planted in the place to which offerings were brought. Further south, in front of the same mountain range, this landscaping was continued. The funerary temple of Tuthmosis III may have been approached by a canal ending in a rectangular pool in front of a monumental gateway. A canal led from the river to Amenophis III's temple, in front of which was a great lake full of plants, and deep enough for boats to sail on, taking the statues of the dead king and queen on ceremonial voyages. This lake would have spread out in front of the colossi of Memnon, which were statues representing the king, which stood in front of the pylonic entrance to the temple. Behind the temple of his royal master, was the funerary temple of the royal architect, Amenophis son of Hapu, one of the very few courtiers allowed a temple actually among those of the kings. On the lower terrace in front of the temple, trees surrounded the pool.[56] Away across the desert lay the huge lake of Birket Habu surrounded by profuse vegetation; and the palace of Amenophis III which had its vineyards and orchards around it.[57]

In the Nineteenth Dynasty the landscape below the mountains was probably still as lush, although later kings pillaged Amenophis III's funerary temple of its statuary and building material in order to create their own monuments.[58] Ramesses II's (1279–1213 B.C.) funerary temple, the Ramesseum, had an avenue in front of it and a garden flanking a canal, inside, between the pylons, according to a possible interpretation of a painting in the tomb of the official who was Overseer of the Gardens of the Ramesseum in the Estate of Amun, Nezemger.[59] This garden may have been inside the temple on the southern side of the second court. No evidence of the canal has been found in excavation. In front of Ramesses III's (1187–1156 B.C.) funerary temple, Medinet Habu, at the southern end of the sweep of trees, lakes and funerary monuments, were a canal, pool and trees. Inside the temple were several gardens around pools. In succeeding years small funerary chapels were built behind Medinet Habu, with trees in the courts at the entrances, imitating the plantings in the great temple. Somewhere on the mountainside, and now lost, was the funerary temple of Tuthmosis I where, during Ramesside times, his memorial rites were celebrated on a tree-lined lake, according to a painting in the tomb of Userhat.[60] The temples, with their gardens, lakes and canals, were in living and verdant contrast to the desert and rocky scarp of the mountain. They lasted — collectively, though not all at one time — from the reign of Hatshepsut, at least until the death of Ramesses III; a period of more than 300 years, during which time they were

tended and visited by their own priests, and by the priests and courtiers from the temple of Amun at Karnak, as well as by the general populace who took part in the festivals.

On the east bank of the river the landscape was just as verdant. The main temples of Karnak and Luxor had gardens inside and out.

Landscape of Amarna

At Amarna, the site sacred to the sun god, the desert plain was made green by parks at either end; and temples, palaces and houses with their own gardens filled the built-up area. At the southern end was the vast open-air temple, and at the northern end, another more enclosed temple or palace, with a garden in the centre. In between these parks, lay clusters of buildings with avenues leading up to them, and gardens around them, some of them with pools. In the suburbs, the gardens surrounding a few of the great houses formed oases between the whitewashed buildings. The river bank, where ships unloaded in front of the palace, was planted with trees and flowers in containers, and a flower bed, beside the naturally growing papyrus and mandrake.[61] The effect from the landing stage must have been of the river bank creeping towards the eastern mountain.

Landscape around Memphis

At Heliopolis, Ramesses III decreed that date and olive groves be established, and ordered gardens and incense trees to be planted at Memphis.[62]

Whether the pyramids at Giza had any trees or gardens around them is not known, although there is the suggestion of a garden between the Step Pyramid and the Causeway of Unas. At the river end of the causeways there was plenty of vegetation, but that was not contrived by man.

Landscape of the Delta

In the much more fertile Delta, a vast orchard and vineyard surrounded the palaces and temple at Avaris (Tell Dabaa) and Pi-Ramesses. Ramesses III ordered the planting of orchards here, and at many religious centres.

ANCIENT DESIGNERS AND CLASSIFICATIONS OF GARDENS

Garden Designers

Ancient Egyptian gardens were made by architects, some of whom are known by name: Senenmut, who advised Queen Hatshepsut, and Amenophis, son of Hapu, who designed Amenophis III's (1390–1353 B.C.) monuments, are two of the most famous. The names of some individual workers in the gardens are also known.

The ancient Egyptians classified their gardens by their form, by what they grew, and by the buildings to which they were attached. Forms could be a piece of ground divided into squares for cultivation, an open terraced area, a sunken or level peristyle or atrium within a building, or a park, which might contain a pool. Gardens could also be described by the plants which grew in them, such as vegetable gardens, olive groves, fruit orchards, vineyards, groves of incense trees, and trees for use in carpentry. There were words for describing the gardens of specific buildings: of tombs, palaces, and temples, and of estates, both of the living, and of the dead.[63] Gardens had individual names, just as buildings had names. The garden created by Akhenaten (1353–1336 B.C.) at Amarna for the globe of the sun, the Aten, was called 'The Seeing-Place of the Aten'. And the shrines

with gardens on the route between the Karnak and Luxor temples had names like 'Hatshepsut is united with the perfection of Amun'.

Summary

The sacred gardens of ancient Egypt at Thebes and Amarna were decorated with many of the garden features which survived through Roman and Islamic times, and became fashionable in eighteenth-century Europe. The power and splendour of the ruler were demonstrated in extensive gardens in front of their funerary temples at Deir el Bahari, and in and around the temple of Amun at Karnak. At Amarna, in the *Maru-Aten*, there was a large artificial lake, an ornamented quay, temples, garden walks, avenues, a gatehouse, and maybe even a banqueting house. Its companion garden, the 'Northern *Maru*', included a sunken *atrium* garden and a menagerie, as well as a central pool and small shrines.

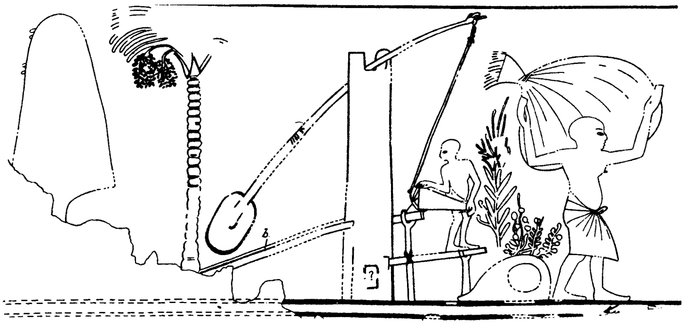

Figure 13. A gardener pouring water from the bucket of the shaduf into a runnel which leads into the brick container holding a date palm
Source: Norman de Garis Davies, The Tomb of Nefer Hotep at Thebes *(New York, 1933)*

Ancient Egyptian landscape gardeners created lavish plantations at temples and city sites. Great sweeps of desert, covering over a mile at a time, were kept full of trees. The Egyptians' main practical problem was connected with the control and provision of water, which they managed to overcome by creating canals and pools inside, and in front of, their buildings, and by the constant use of the shaduf and bucket (Figure 13). The gardeners' success was spectacular, and sustained over many hundreds of years.

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4. James Stevens Curl, 'John Claudius Loudon and the garden cemetery movement', *Garden History*, 11:2 (1983), p. 137; in the eighteenth century, Henry Home, *Elements of Criticism* (1762), had maintained that the 'art of gardening' was 'capable of stimulating more widely diverging emotions

than architecture', quoted by Lucia H. Albers, 'The perception of gardening as art', *Garden History* 19:2 (1991), p. 170; and William Chambers believed with others in the latter part of the eighteenth century that 'beautiful or sublime gardens should have an effect on the emotions', David Jacques 'On the supposed Chineseness of the English Landscape Garden'. *Garden History* 18:2 (1990), p. 185.

5. R. C. Turner, 'Mellor's Gardens', *Garden History* 15:2 (1987), pp. 157–66, at Hough-Hole House, Rainers, Macclesfield, which was based on ideas of Swedenborg (1688–1772) being a 'garden of correspondence relating to things of this world and scriptural history'. It originally contained plants mentioned in the Bible. Collections of plants mentioned in the Bible have been made in this country (and in Jerusalem) by Dr Nigel Hepper and are to be found in several gardens in the United States.

6. John Colleran, and Eileen McCracken, 'The Japanese Garden, Tully House, Kildare', *Garden History* 5:1 (1977), pp. 35–38.

7. Claudia Lazzaro, *The Italian Renaissance Gardens* (1991), reviewed by Vanessa Stephen, *Garden History* 20:1 (1991), p. 90: 'Plants were woven into the design', and formed 'part of the allegorical content of the gardens'.

8. Roy Strong, *The Renaissance Garden in England* (London, 1979) p. 10: 'Each flower within a great garden was seen to mirror one of her regal virtues, while its overall composition could proclaim Elizabeth in her varying roles as Spenser's "most royall queen or empresse" . . . the garden . . . became Gloriana's glass'; p. 47, Elizabeth I was the eglantine rose.

9. Being replaced by 'theme parks', such as the Beatles garden in the Liverpool garden festival, Jane Brown, *The English Garden in our Time* (Woodbridge, 1986) p. 222.

10. The discussions in English landscape gardening circles from the late nineteenth century onwards are about form: 'formal' versus 'natural' (Laurence Weaver, *Houses and Gardens by E. Lutyens* (Woodbridge, 1981 reprint), p. xviii, or 'modern' versus 'English garden' (as exemplified in Jason Hill's *Gardener's Companion*, 1936). Jane Brown, *The English Garden in our Time* (1986) p. 129.

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16. Rainer Stadelmann, '*Šwt-Rʿw* als Kultstätte des Sonnengottes im Neuen Reich', *Metteilungen des Deutschen Archäologischen Instituts, Abteilung Kairo* 25.2 (1969), p. 161: 'Der Tempel wird dabei ein Abbild der Welt gedacht die der Sonnengott in Gestalt des Amun-Re täglich überquert'; Wolfgang Helck, Eberhard Otto, *Lexikon der Ägyptologie*, i (Wiesbaden), p. 397. Architectur: 'So ist der Tempel ein Weltmodell, ein 'Fahrplan des Kosmos'.

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22. R. O. Faulkner, *The Book of the Dead* (New York, 1972), ch. 109: 'I know those two trees of turquoise between which Re goes forth'.

23. *The Shell Gardens Books*, edited by Peter Hunt (London, 1962), p. 180.

24. Offerings, floral: James Henry Breasted, *Ancient Records of Egypt* (Chicago, 1906–07), IV, pp. 244, 301; vegetable: ibid. IV, p. 244; fruit: ibid. IV, pp. 234, 294–45; incense: ibid. IV, p. 294; perfume: ibid. IV, p. 286.

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34. As Jean-Claude Hugonot, *Le Jardin dans l'Egypte ancienne* (Frankfort-am-Main, 1989), p. 72.

35. John D. S. Pendlebury, *The City of Akhenaten*, III (London, 1951), pp. 86–87, pls i, xlvi 'At the north end of the west side are two terraces at a lower level, but a small flight leads down to the lowest where there was evidently an arbour.'

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39. E.g., Meten, Hans Goedicke, 'Die Laufbahn des *Mtn*', *Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo* 21 (1966), pp. 64–65, or the description of the estate of Raia; Miriam Lichtheim, *Ancient Egyptian Literature*, II (Berkeley, 1974), p. 173. 'The lapping of waves sounds in one's sleep'.

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55. William H. Adams, *Nature Perfected: Gardens Through History*, p. 83, comments on the position of the Taj Mahal (1632–54) being at one end of the central axis, 'so that it can easily be seen from the Jumna River below', and thus departing from the *chahar bagh* pattern where the tomb-pavilion is in the centre.

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Grapevines in Ashurbanipal's Garden*

PAULINE ALBENDA

Among the decorated rooms of the seventh century B.C. North Palace of Ashurbanipal in Nineveh, several large fragmentary reliefs depict an idyllic episode in which there appear musicians with stringed instruments, servants leading hunting-dogs, striding or relaxing lions and a recumbent lioness.[1] A row of alternating date-palms and coniferous trees with vines twining around their trunks provides the backdrop for this enchanting scene. Blossoming flowers and shrubs occur, too, and are a charming addition to the tranquil setting. This combination of human, wild animal, and foliage elements within a single composition, while attested in Assyrian sculptural art dealing with hunting scenes,[2] is unique on these reliefs for the unexpected peaceful relationship between man and lion, and for details of flowering plants inside a formal landscaped garden.[3]

On the reliefs the contours of the flowers have been simplified but are nonetheless remarkable for the exactitude of essential features so that specific types can be distinguished. In one section three flowers in a cluster, each growing on a long plain stem, are depicted with the upper floral portion turned frontally and thereby reveal the main outlines as if seen from above (Figs. 1-2). These tall ray flowers, consisting of a central disk surrounded by petal-like flowers, resemble the Ox-eye Sunflower, a member of the *Carduaceae* family of wild flowers often found along the roadside and in fields.[4]

Nearby, flowers in a profile rendering with petals in a trefoil arrangement are distinctive as belonging to the Lily Family, one of a series of true lilies (*lilium*; Figs. 3-4).[5] They bloom on slender stems possessing parallel rows of long, narrow leaves of diminishing lengths. Several stages of a blossoming lily can be observed: a closed bud, a partially opened bud, and a lily in full bloom. Flowering lilies constituted a popular ingredient of Ashurbanipal's garden, to judge by their reappearance in scenes with a related setting on a group of reliefs in three registers from Room S in the same palace. There, in one section of the middle register, is represented a female servant in the act of plucking flowers from their stems,[6] and elsewhere another attendant carries in one hand a bunch of lilies upon a flat reed basket, while grasping a blossom in the other upraised hand (Fig. 5).[7] From this last series of reliefs it is clear that the pomegranate tree comprised another favorite plant in the garden, for these shrubs are set neatly between large coniferous trees (Fig. 6). The fruits appear in characteristic outline form among the leafy branches.

The single representation of another plant provides a further addition to the royal garden, dense with colorful vegetation.[8] The low growing shrub has large leaves spreading out in opposite directions and from the center rise several small stems with terminal berry-like flowers.[9] This plant can be identified as the mandrake (*Mandragora*), a Mediterranean herb of the nightshade family. Its early appearance as a decorative element upon an Egyptian wood chest overlaid with ivory, from the tomb of Tutankhamun, indicates that it was long known in antiquity.[10] Egyptian art of the Amarna period also reveals that the plant enjoyed some popularity. Its flower comprises part of a bouquet held by an Egyptian queen, shown on a painted relief;[11] and upon a polychrome tile the mandragora is depicted, showing yellow fruits and green leaves outlined in red-brown.[12]

Although not visible on the extant reliefs of Ashurbanipal, other flowering plants may have been cultivated in the royal garden. On a series of reliefs from Sennacherib's reign (704-681 B.C.), now lost and preserved only in drawings, clusters of tiny round flowers still attached to their leafy stems are arranged in large ovate vessels carried upon the shoulder of attendants.[13] One may speculate further whether roses were numbered among the flowering plants. Rose-gardens were grown in Phrygia by the late eighth century B.C.,[14] and a thorny plant perhaps to be identified as a fruit-bearing member of the rose family, the blackberry,[15] is described in the Assyrian version of the *Epic of Gilgamesh.*[16] Small fruits resembling berries are one of several edible items brought on trays by Sennacherib's servants, presumably for a feast, shown on another portion of the now lost reliefs.[17] The other fesh fruits consist of figs, grapes, pomegranates, and olives still on the branches (?); these form part of the royal meal that includes, too, locusts on skewers, birds, and hares.[18]

The luxuriant garden of Ashurbanipal may have

been embellished with one or more ponds covered with floating water lilies (*Nymphaea*), an aquatic plant derived ultimately from Egypt.[19] This assumption is made plausible by the appearance of the sweet-scented flower held in the upraised hand of the Assyrian king during the banquet (Fig. 7), a scene that occurs on the upper register of the reliefs from Room S. Moreover the inclusion of a pond in the royal park is attested on the Assyrian reliefs as early as the reign of Sargon II (722-705 B.C.).[20]

A most unusual aspect of the garden is the inclusion of grapevines, their tendrils branching out in several directions. The coniferous trees around which the vines twist can be identified by their thin linear leaves arranged in five-needled radial clusters to the twigs as members of the Pine Family, probably the white pine (Fig. 8). A second type in the garden belonging to the same tree family has foliage consisting of long linear leaves extending outward from the branches in a manner that is similar to the cypress or spruce tree (Fig. 9).[21] The main trunk of the pine tree with the entwined vine shows evidence of pruning since large shallow stumps are all that remain of the lower branches. Its upper branches are drawn decoratively as up-curving arms. The motif of a vine twisted around a tree is the earliest known representation showing the technique of training vines "wedded" to trees, and is one of the six methods of viticulture commonly used by Roman times.[22] As the reliefs reveal, furthermore, the pine trees supporting the mature vines are planted some distance apart and this indicates that Ashurbanipal's garden included an *arbustum*, a type of culture that was fully understood by Assyrian viticulturists. Elsewhere on the reliefs from Room S the wedded vines are pruned in an ornamental manner so that a single vine on each of the paired trees spreads out and, together, these form a natural canopy for the banqueting king, reclining on his couch, and his consort (Fig. 10).[23] The overhanging vines were probably originally trellised with rope or reed which is here omitted for esthetic reasons.[24] These vines terminate in forked tendrils, the outer ones curled into fine volutes (Fig. 11). The careful rendering of the vines describes how the cluster of grapes and the deeply veined five-lobed leaves sprout from the main stalk (Fig. 12).

Texts of Ashurbanipal seem to offer little information concerning the care of vineyards during this period.[25] However, grapevines are known to have constituted one of the many plants of the Assyrian royal garden as early as the ninth century B.C., when they are mentioned together with many other plants and trees collected by Ashurnasirpal II during his campaigns, and subsequently planted in the grounds surrounding his palace at Calah.[26] On one now lost relief dated to this period grapevines occur growing just beyond a walled town constructed upon a mound and under siege by the Assyrian army.[27] The city is not identified and its geographical location remains uncertain, although the inclusion of a vineyard may indicate that this area was notable as a wine-producing region.[28] The vines are drawn spread low above the ground and illustrate a method of vine training commonly used throughout many parts of the world.

Grapevines do not appear again on the Assyrian wall reliefs until the early seventh century B.C., in the reign of Sennacherib. Among the many scenes depicting that king's campaigns in Palestine, vineyards are shown situated outside walled cities. One such vineyard is seen in the terrain surrounding Lachish.[29] There the vines grow standing alone without props and pruned to give the appearance of small trees (Fig. 13). Some of these vines may have been trained with a rectangular frame, producing arms laid out in four directions in star shape (Fig. 14).[30] Interspersed among the vines are flourishing fig trees. On another series of reliefs dealing with a similar geographic region, outside a city identified as "*-alammu*", a vineyard with the same vine culture is partially visible behind a high enclosure (Fig. 15); there, each planted vine alternates with a tree possessing small elongated leaves (probably an olive tree).[31]

Like his predecessors, Sennacherib ordered a park containing local and imported plants to be situated near his new palace at Nineveh.[32] In conjunction with this he had a large aqueduct constructed and channeled into small irrigation ditches to increase the water supply for the orchards and vineyards within and near Nineveh.[33] The series of large reliefs depicting the stages in the construction of Sennacherib's "Palace without a Rival" show a hilly terrain near the palace site. Planted upon it are a variety of shrubs and trees, including fig trees and grapevines.[34] Several of the vines grow close to coniferous trees and occasionally vine branches emerge from behind such trees. The occurrence of these two flora—grapevines and coniferous trees—growing in close proximity in the wilderness is attested by

Fig. 1

Fig. 2

Fig. 3

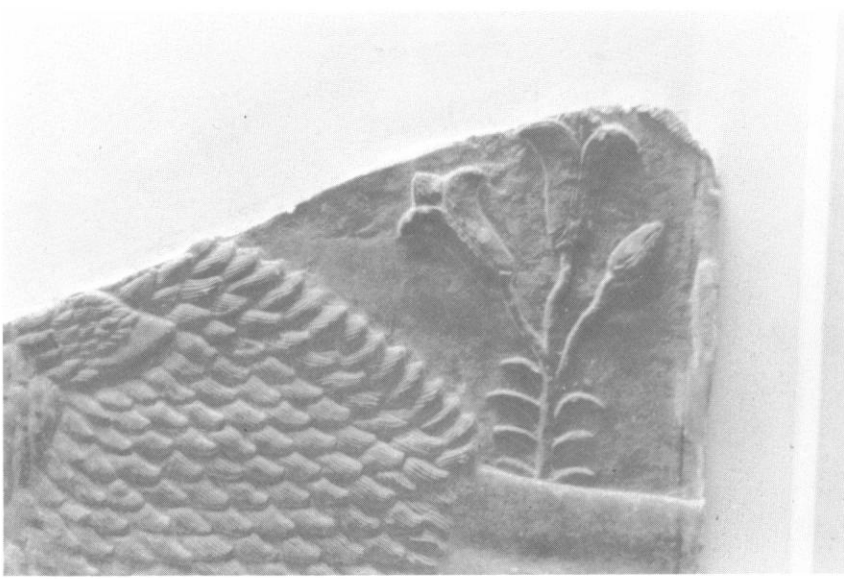

Fig. 4

Fig. 5

Fig. 6

another relief, now lost, illustrating Sennacherib and his army marching past a dense forest of huge pine trees in a rugged mountainous region through which flows a wide river alive with fish.[35] Immediately beyond the forest a large portion of the terrain has been cleared for the cultivation of tree-like grapevines. We may surmise that this scene illustrates Sennacherib's fifth campaign and that the region is to be located near the country of Urartu which is known for its Cypress, Plane, and Pine forests.[36] According to the texts of his predecessor, Sargon II, the cultivated lands of Urartu included extensive vineyards, a feature of the terrain confirmed by the inscriptions of eighth century B.C. Urartian kings which mention the construction of buildings, vineyards, and irrigation canals.[37] Moreover, Sargon II describes many of the fortified cities of the region "like (wild) grapevines growing on the mountain-(side)."[38] His graphic report may allude to the knowledge that vines in a wild state will climb to the tops of the tallest trees. From this one may infer the possibility that the wedded vine culture was practiced in this region—or in another region in Anatolia where viticulture occurred close to a pine forest—whence it was introduced into Assyria.[39]

The grapevine or its fruit appears several times in Near Eastern art in contexts that seem to have religious significance. Its most notable occurrence is upon the anthropomorphic form of the deity Santas, carved into the hillside at Ivriz in the Taurus Mountains.[40] There the prominent vine twists obliquely around the torso of the divine figure who holds in his outstretched hand ears of grain and wavy streams of water flowing downward. The deity is confronted by the figure of king Urballa of Tyana, a contemporary of the Assyrian king Tiglath Pileser III (744-727 B.C.), who stands with both hands upraised to his face in the traditional Anatolian gesture of prayer.[41] The deity Santas, decorated with thriving plants, reflects a later version of fertility gods depicted in the Near East as early as the third millennium B.C., during the Akkad Dynasty.[42] One exceptional early example is the large alabaster cult plaque found in Ashur and dated to the Middle Assyrian period, ca. 1400 B.C.[43] Carved in relief is a fertility deity *en face*, dressed in a garment designed with a scale pattern, the traditional symbol of the mountains. In each hand he grips a branch having three cone-shaped terminal leaves. A similar branch grows on each side of his body. Above are two flanking goats nibbling on the branches. The god is accompanied by two small goddesses who hold in each hand a vessel from which streams of water flow. In contrast to the Assyrian and other early representations of fertility deities, Santas introduces a new plant, grapes on the vine, which by its position and size indicates it to be an essential aspect of the god.[44]

A fragmentary plaque from Nimrud, dated to the second half of the eighth century B.C., furnishes a second example illustrating grapes in a setting with religious implications.[45] As reconstructed, in the upper center is an elaborate winged disk, and emerging from its sides are tendrils with grape clusters. Below, two persons in Assyrianizing costumes confront each other and raise one arm to grasp the fruit. The divine relationship between the winged solar disk and the grapevine is evident.[46]

A cluster of grapes recurs in a third art work, on an eighth century B.C. funerary stele from Marash that depicts a seated man and his wife holding objects.[47] The cluster of grapes held by the man is thought to signify his profession as a wine merchant but it seems more likely to this writer that the fruit is to be interpreted as having symbolic importance, or else it is an attribute of divinity associated with the grapevine.[48] If this assumption is correct, then the mirror held in the hand of the wife likewise has religious meaning. As other works of this period reveal, the possession of a mirror was apparently the prerogative of women. The object is gripped by a young girl standing alongside her parents in a banquet scene carved on another funerary stele from Marash,[49] and on a fragment of a relief in bronze the mirror is held in the hand of the Assyrian queen Naqi'a, wife of Sennacherib, mother of Esarhaddon, and grandmother of Ashurbanipal.[50] The queen stands immediately behind her son in a scene of adoration. Furthermore, several eighth-seventh century B.C. representations of the Anatolian goddess Hubaba carved upon stelae show her holding a mirror, her distinctive attribute during this period.[51]

The notion of divinity associated with a plant, notably a tree, is not strange for Near Eastern iconography, as the sacred tree held a prominent position in Assyrian art. Its religious nature is stressed, for example, on a bas-relief that originally decorated the wall behind the throne of Ashurnasirpal II. The elaborately-drawn tree appears in the center of a symmetrically composed group, flanked on each side by the king and a winged deity, while above, the god Ashur emerges

Fig. 7

Fig. 8

Fig. 9

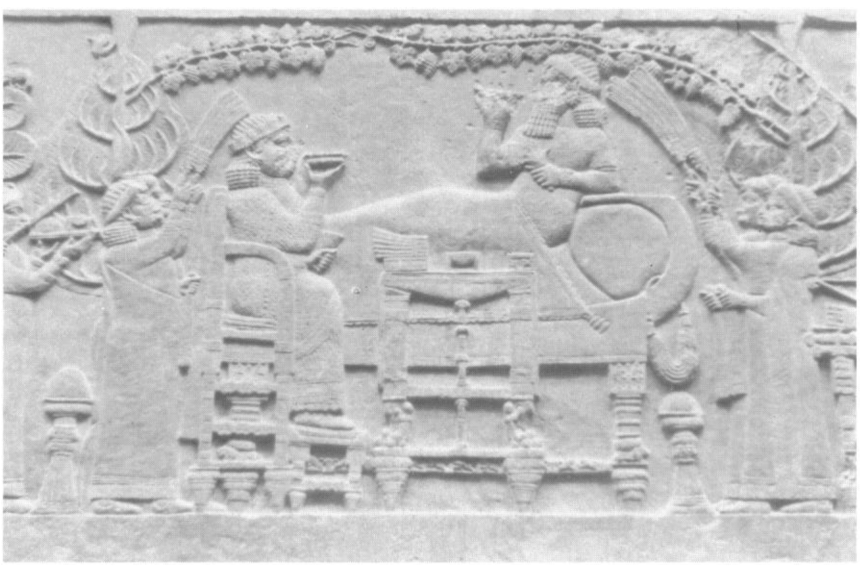

Fig. 10

Fig. 11

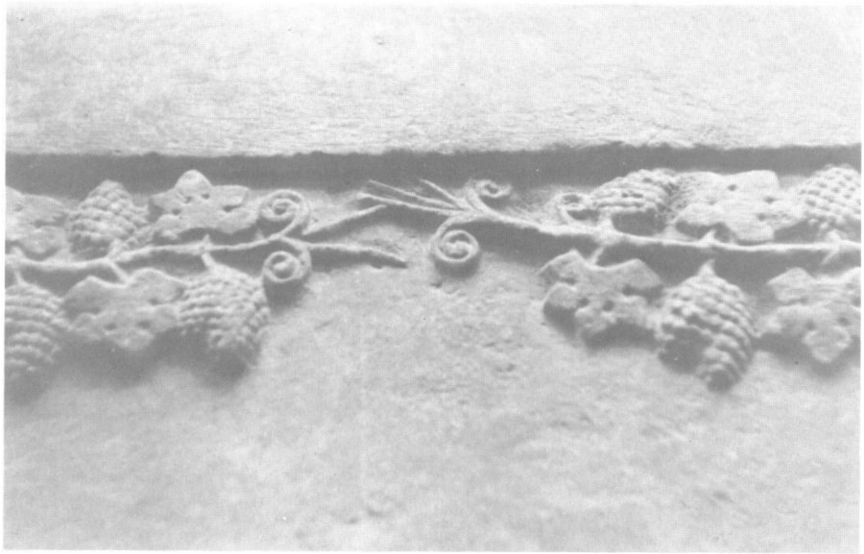

Fig. 12

from a winged disk.[52] This scene symbolizes fertility for both the king and the tree. The desire for fertility and growth of crops in the land is most probably the meaning behind the watering of small potted trees by such early Mesopotamian rulers as Ur-Nammu, who is shown performing the ritual before enthroned deities on his stele.[53] Of related significance is the introduction of the grapevine as another plant to be assimilated with a fertility deity, an event we suggest coincided with the increasingly important and widespread development of viticulture in the Near East, during the early centuries of the first millennium B.C.

Returning to the pictorial version of the "vine entwined around a tree", it is curious that its appearance in the royal garden shows the full development of a motif for which there is, at present, no precedent.[54] This rendering as a type is not to be confused with the technical facility displayed, which can be easily explained by the skills of the artisans who carved the bas-reliefs. The prominence given to the use of the wedded vine motif as a continuous backdrop for the large garden scene, and particularly as an architectural framework for the banqueting king and his consort, suggests that this method of viticulture was newly introduced into Assyria. Moreover, since it has been demonstrated that in art works grapevines were sometimes depicted associated with divinity in some manner, the postulation that the wedded vine motif on the Assyrian wall reliefs may likewise embody religious intent deserves serious consideration.

* The photographs were taken by the writer. I am grateful to the Trustees of the British Museum for allowing the art works to be studied without restrictions. Abbreviations used: *ANET*² = J. B. Pritchard, (ed.) *Ancient Near Eastern Texts Relating to the Old Testament*, 2nd ed. (Princeton, 1955); *ARAB* = D. D. Luckenbill, *Ancient Records of Assyria and Babylonia* (Chicago, 1926; reprint, 1968) 2 vols.; *5000 Years* = E. Strommenger, *5000 Years of the Art of Mesopotamia* (New York, n.d.); *Mesopotamia* = A. Moortgat, *The Art of Ancient Mesopotamia* (New York and London, 1969); *Plant Life* = C. Hylander, *The World of Plant Life*, 2nd ed. (London, 1956).

[1] See: Strommenger, *5000 Years*, pls. 244-45, p. 453; Moortgat, *Mesopotamia*, pl. 283, p. 157.

[2] Moortgat, *Mesopotamia*, pls. 273-274. The entire sequence of scenes dealing with the royal hunt in the reign of Sargon II is found in Botta and Flandin, *Monument de Ninivé*, II (Paris, 1849) pls. 107-14.

[3] This recalls the "paradise" theme encountered in literature, cf. S. N. Kramer in *ANET*², pp. 37-41; and in art upon a Kassite boundary stone, cf. Moortgat, *Mesopotamia*, pls. 231-32, pp. 102-3.

[4] Hylander, *Plant Life*, pp. 479ff.

[5] *Ibid.*, pp. 546-52.

[6] C. J. Gadd, *The Stones of Assyria* (London, 1936) pl. 40.

[7] This fragmentary relief is one of six recently acquired by the British Museum. See: *British Museum Quarterly* 34 (1970) 193 and 36 (1972) 136 (several of the fragments are illustrated).

[8] Archaeological evidence indicates that the Assyrian wall reliefs were originally painted partially or fully. The colors which have been chiefly distinguished are blue, red, yellow, black, white. Moreover, at Khorsabad these colors occurred with the addition of yellow and green. A. H. Layard, *Nineveh and Its Remains* (New York, 1856) pp. 241-43. For a discussion regarding the sources of the colors, see R. C. Thompson, *A Dictionary of Assyrian Chemistry and Geology* (Oxford, 1936) pp. 81-83.

[9] Strommenger, *5000 Years*, pl. 245.

[10] See: Langer and Hirmer, *Egypt. Architecture. Sculpture. Painting in Three Thousand Years* (New York, 1956) pl. 193, p. 334; C. Aldred, *New Kingdom Art in Ancient Egypt During the Eighteenth Dynasty, 1570 to 1320 B.C.* (London, 1961) pl. 154, p. 87.

[11] C. Aldred, *Akhenaten and Nefertiti* (New York, 1973) no. 120, pp. 188-89.

[12] *Ibid.*, no. 160, p. 216. The unusual place this plant held in ancient folklore is remarked upon by R. C. Cleveland in *JAOS* 93 (1973) pp. 201-2.

[13] A. Paterson, *Assyrian Sculptures. Palace of Sinacherib* (The Hague, 1915) pl. 88.

[14] R. D. Barnett, *Cambridge Ancient History*, II, chap. XXX (rev. ed., 1967) 19.

[15] *CAD*, s.v. *amurdinnu.* I owe this reference to Professor Stephen L. Lieberman.

[16] E. A. Speiser in *ANET*², p. 96.

[17] Paterson, *Sinacherib*, pl. 89.

[18] For a description of a royal feast given by king Ashurnasirpal II (883-859 B.C.), in which many kinds of foods are enumerated, see J. B. Pritchard, (ed.) *The Ancient Near East. Supplementary Texts and Pictures Relating to the Old Testament* (Princeton, 1969) p. 124.

[19] Hylander, *Plant Life*, pp. 602-3. The rendering of the water lily already appears in the reign of Sargon II, for that king likewise holds the blue flower in his hand. See Botta and Flandin, *Ninivé*, pl. 113. In more decorative manner it was used together with the palmette, rosette (similar to the sunflower), and pine cone in an elaborate design that covered the alabaster threshold from the palace of Sennacherib, cf. Strommenger, *5000 Years*, pl. 230, p. 449. A similarly designed threshold was found in the palace of Ashurbanipal. H. Schmökel, *Ur, Assur und Babylon* (Stuttgart, 1958) Tafel 109.

[20] Botta and Flandin, *Ninivé*, pl. 114.

[21] Hylander, *Plant Life*, pp. 144ff.

[22] W. F. Jashemski, "The Discovery of a Large Vineyard at Pompeii: University of Maryland Excavations, 1970," *AJA* 77 (1973) 33-36. For further reading concerning this vineyard, see *idem, Archaeology* 25 (1972) 48-56, 132-39.

[23] The writer is presently preparing for publication a reconstruction of the landscape reliefs containing this important

Fig. 13

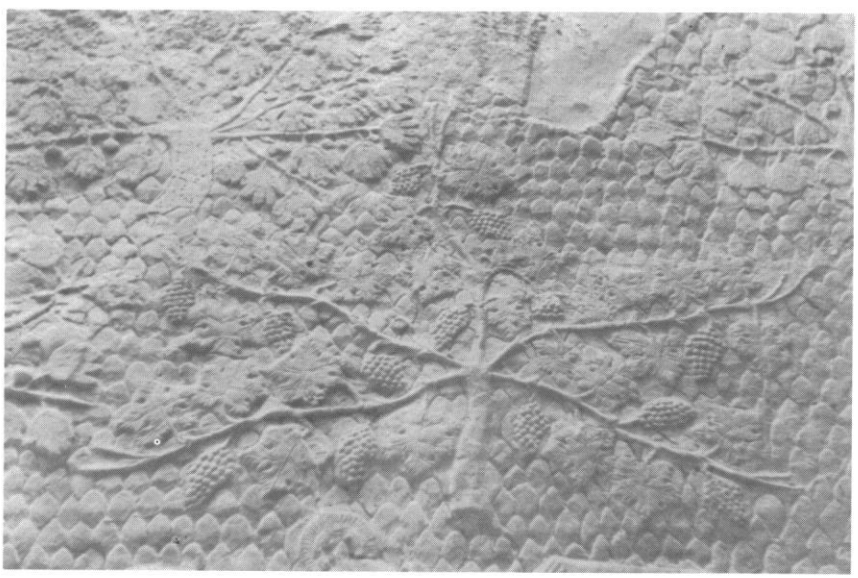

Fig. 14

Fig. 15

scene, based upon the original drawings and extant fragments. For a comprehensive study of the *symposion* theme, see J. M. Dentzer, "Aux origines de l'iconographie du banquet couché," *Revue Archéologique* (1971) 215-58. I am grateful to Dr. Oscar W. Muscarella for drawing my attention to this article.

[24] This method appears in an 18th Dynasty Egyptian wall painting. See N. de Garis Davies, *The Tomb of Nakht at Thebes* (New York, 1917) pls. XXII-XXIII, pp. 69-70.

[25] Land sales of the seventh century B.C. dealing with gardens, orchards, or plantations, are vague regarding the specific types of cultivation undertaken on these properties. C. H. W. Johns, *Assyrian Deeds and Documents. Recording the Transfer of Property*, IV (London, 1923) 29ff.; 200ff.

[26] A. L. Oppenheim in *ANET, Supplement*, pp. 122-23. The Assyrian custom of filling the royal garden with imported plants occurs as early as the reign of Tiglath Pileser I (ca. 1100 B.C.); see Luckenbill, *ARAB*, I, 87. According to Oppenheim, however, the custom of incorporating a royal garden for display purposes or personal pleasure only, first occurs in the Sargonid period. "On Royal Gardens in Mesopotamia," *JNES* 24 (1965) 331.

[27] R. D. Barnett and M. Falkner, *The Sculptures of Assur-Nasir-Apli II (883-859 B.C.) Tiglath-pileser III (745-727 B.C.) Esarhaddon (681-669 B.C.)* (London, 1962) pl. CXVIII.

[28] Barnett and Falkner believe that this relief originally adjoined another relief on which a rope and pulley is represented, *ibid.*, p. 25. However see this writer's study of the rope and pulley in *BASOR*, No. 206 (1972) 42-48.

[29] Paterson, *Sinacherib*, pls. 71-73.

[30] For the description of this method of viticulture, see Jashemski, *loc. cit.* (n. 22).

[31] The entire series of these reliefs is illustrated in Paterson, *Sinacherib*, pls. 39, 98.

[32] Luckenbill, *ARAB*, II, pp. 159-60, 170ff.

[33] *Ibid.* Such a scene showing a royal park on a hillside, watered by an aqueduct and irrigation canals, is found among the large reliefs of Ashurbanipal. Cf. H. Frankfort, *The Art and Architecture of the Ancient Orient* (paperback edition, 1970) fig. 207, p. 183.

[34] Paterson, *Sinacherib*, pls. 32-35.

[35] *Ibid.*, pl. 16.

[36] Luckenbill, *ARAB*, II, 122-23, 144-45. On the Pine forests of this region see the remarks of M. B. Rowton, "The Woodlands of Ancient Western Asia," *JNES*, 26 (1967) 273.

[37] G. Azarpay, *Urartian Art and Artifacts. A Chronological Study* (Berkeley and Los Angeles, 1968) pp. 18, 45.

[38] Luckenbill, *ARAB*, II, 33ff., 84ff.

[39] The Taurus region contains Pine forests, see Rowton, *JNES*, 26 (1967) 264. Tribute presented to Ashurnasirpal II by the kings of this region included wine; see Luckenbill, *ARAB*, I, 178-79.

[40] E. Akurgal, *The Art of the Hittites* (London, 1962) pls. XXIV, 140.

[41] Urballa belonged to a coalition of Tabalian princes who fought against the Assyrian king. See Barnett, *op. cit.* (n. 14), pp. 10-11.

[42] E. Porada, *Corpus of Ancient Near Eastern Seals in North American Collections*, The Bollingen Series XIV (New York, 1948) figs. 207-14.

[43] Moortgat, *Mesopotamia*, pl. 236, pp. 111-12.

[44] The standard combination of thriving plants and flowing water as attributes appropriate for a deity of fertility is demonstrated in a text, in a prayer to the god Ninurta in this aspect; see S. N. Kramer in *ANET, Supplement*, pp. 140-41.

[45] Strommenger, *5000 Years*, pl. 266, p. 455.

[46] The subject recurs on an orthostat relief from Sakçegözü, illustrated in Akurgal, *Hittites*, pl. 134, *idem, The Art of Greece. Its Origins in the Mediterrranean and Near East* (New York, 1968) pl. 15a, p. 59.

[47] Akurgal, *Hittites*, pl. 139, p. 139.

[48] Akurgal recognizes a symbolic character in the appearance of such items as food or an ear of grain on other funerary stelae of this period. But see his conclusions regarding other objects, *The Art of Greece*, pp. 129ff.

[49] *Ibid.*, pl. 28.

[50] A. Parrot and J. Nougayrol, "Asarhaddon et Naqi'a sur un bronze du Louvre (AO 20.185)," *Syria* 33 (1956) pl. VI.

[51] M. Vieyra, *Hittite Art. 2300-750 B.C.* (London, 1955) pls. 51, 59, 65, pp. 71, 73, 75. For a discussion of this goddess in later periods, see Hanfmann and Waldbaum, "Kybele and Artemis: Two Anatolian Goddesses at Sardis," *Archaeology* 22 (1969) 264-69.

[52] Strommenger, *5000 Years*, pl. 191, p. 439.

[53] Moortgat, *Mesopotamia*, pls. 194, 210.

[54] Except for the substitution of the poplar tree for the pine, this motif remained unchanged till recent times. Its appearance in paintings remains symbolic; cf. M. Kahr, "Delilah," *The Art Bulletin* 54 (1972) 287-88. Modern vineyards in Italy still use the poplar to stake the vines, a technique followed since antiquity. Regarding this, see the observations of W. F. Jashemski in *AJA* 72 (1968) 73.

HELEN M. LEACH

ON THE ORIGINS OF KITCHEN GARDENING IN THE ANCIENT NEAR EAST

THE ECONOMIC BASE of cultures belonging to the 'western' tradition, which had their origins in Europe and the Near East, is generally considered to be agricultural. By this term, we imply cultivation of field crops, both cereals and legumes, and management of certain animal species for their meat, milk and skins. Yet the rural countryside occupied by western cultures is not only made up of fields and farmyards, but plantations of trees for timber, orchards for fruit, and various types of gardens. Historically, gardens which produced vegetables and flavouring plants for human consumption have been known as kitchen gardens, and they have often included small fruiting trees and shrubs which require regular attention. These gardens are usually situated close to the kitchen, and are enclosed by walls, fences and hedges which serve to keep browsing animals away from succulent fruits and vegetables, give shelter to tender plants, and are a visual reminder to outsiders that the contents are the property of the homestead and do not fall into the category of wild vegetables, fruits and herbs free for the taking.

Managing a kitchen garden demands a rather different set of skills and techniques from cultivating field crops. In 1965 Jacques Barrau[1] drew attention to the distinctive tools used in horticulture, and the close association of gardener and plants brought about by techniques like vegetative propagation, transplanting, hand weeding, and selective harvesting over a long period. This association favours innovation and a continued interest in plant diversity. Thus the gardener can readily spot a superior plant (caused by hybridization or bud mutation) and rapidly increase it, whereas the agriculturalist deals with his plants *en masse* and his harvesting methods encourage uniformity in his seed stock. While Barrau maintained that horticultural traditions were of great antiquity and might pre-date agriculture in some parts of the world, there was little response to his article from the palaeoethnobotanists who continued to concentrate their efforts on the history of cereal and pulse agriculture, and who have published quite detailed accounts of the processes and chronology of their domestication.[2] One of the obvious reasons was the relatively high recovery rate of the large-seeded cereals and legumes in the early Neolithic villages, and the fact that the process of domestication could be 'read' from the appearance of the various parts of the seed heads. Finds of large-size pips, kernels and stones of fruit also allowed the documentation of the origins of the first orchard trees,

University of Otago, Dunedin, New Zealand

especially olives, grapes, dates and figs.[3] In addition, since the seeds of cereals and legumes were the utilized components of the plants, domestication and the accompanying improvement in cultivation techniques led to measurable increases in size. A leafy vegetable like purslane, gathered while young and tender from the banks of a watercourse, would leave no seeds in the settlement. Even if taken into cultivation in plots adjacent to the houses, its seeds would seldom appear in the charred debris of house floors, because the amount of seed stored for replanting at the appropriate season would be minute. If we consider the volume of carrot seed in a modern packet we can appreciate how slim its chances of recovery would be after a house fire and the passage of several millennia. Furthermore, the selection for qualities such as greater leaf area and less bitterness, which characterize the domestication of many leafy vegetables may not lead to any significant change in seed size or morphology. Thus if seed did survive, the palaeoethnobotanist would have no way of knowing if it were from a domesticated green vegetable, a wild potherb, or a weed of no culinary interest to the site's occupants.

Since the most acceptable form of evidence, the remains or impressions of the plants themselves, is so scarce for green and root vegetables, assessment of their importance in Bronze and Iron Age economies of the Near East and Mediterranean relies on documentary evidence and artistic representations from the first three millennia B.C.

KITCHEN GARDENS AND VEGETABLES IN CLASSICAL ROME AND GREECE

There is now archaeological information on Roman vegetable gardens at Pompeii,[4] and in the writings of Pliny the Elder and Columella appear detailed accounts of horticultural lore and techniques together with discussions of vegetable and fruit varieties.[5] These give us a clear impression of surprisingly modern kitchen gardens with nearly a full range of Old World vegetables in cultivation.

Leafy vegetables grown at the time of Pliny include leaf beet (*Beta vulgaris*), blite (?*Amaranthus blitum*), cabbages and kale of at least 12 different types (*Brassica oleracea*), endive (*Cichorium endivia*), lettuce of some 11 different types (*Lactuca sativa*), mallow (*Malva* spp.), orach (*Atriplex hortensis*), purslane (*Portulaca oleracea*), rocket (?*Eruca sativa*), sorrel and/or patience (*Rumex acetosa* and *R.* ?*patientia*), and a group of plants which included alexanders (*Smyrnium olusatrum*) and the progenitors of our modern parsley and celery (*Petroselinum crispum* and *Apium graveolens*). Their root vegetables were the black beet (*Beta vulgaris*), elecampane (*Inula helenium*), radish (*Raphanus sativus*), several types of turnip (*Brassica campestris*), a pungent kind of parsnip (*Pastinaca sativa*), and possibly the skirret (*Sium* spp.). Of the onion family they grew leeks, including the kurrat leek of Egypt (both *Allium ampeloprasum*), at least six types of bulb onion (*Allium cepa*), two or three types of garlic (*Allium sativum*), chives (*Allium schoenoprasum*), and some other *Allium* species which may have included shallots and bunching onions. A number of cucurbits were grown, especially cucumbers (*Cucumis sativus*) and the bottle gourd (*Lagenaria siceraria*). The Latin term *pepones*, sometimes incorrectly translated as pumpkins (a New World vegetable), probably refers to a type of melon (*Cucumis melo*). They grew a large range of flavouring plants, some overlapping in their use with the leafy vegetables. These include basil (*Ocimum* spp.), caraway (*Carum carvi*), chervil (*Anthriscus cerefolium*), coriander (*Coriandrum sativum*), cress (*Lepidum

sativum), cumin (*Cuminum cyminum*), fennel (*Foeniculum officinale*), dill (*Anethum graveolens*), anise (*Pimpinella anisum*), lovage (*Levisticum officinale*), marjoram (*Origanum* spp.), mint (*Mentha spp.*), white and black mustard (*Sinapis alba* and *Brassica nigra*), poppy (*Papaver spp.*), rue (*Ruta graveolens*), savory (*Satureia* spp.), and thyme (*Thymus* spp.). More unusual garden vegetables were asparagus (*Asparagus officinalis*), *Colocasia esculenta*, cardoon (*Cynara* sp.), golden thistle (species uncertain), an edible squill (?*Urginea* sp.), rock samphire (*Crithmum maritimum*), a type of *Muscari*, and *Eryngium campestre*. A modern gardener might comment on the absence of carrots. Although André[6] maintains that it was grown by the Romans, the Latin term *daucus* might be better translated as the pungent wild carrot, used medicinally.[7] The development of our modern carotene carrot from the anthocyanine (purple) form is thought to have occurred many centuries later in the Middle East.[8] Spinach and globe artichokes were also post-Classical cultigens. It should be noted that peas and horse beans (a small type of broad bean), while not described as garden crops, were nevertheless important Roman field crops, along with chickpeas, lentils, lupines and some vetches.

Roman vegetable gardens at Pompeii have been studied extensively by W. Jashemski.[9] A garden behind the House of Pansa measured 26.5 × 30.5 m and had been 'systematically laid out in rectangular plots separated by paths that were also used as irrigation channels'.[10] As Jashemski notes, this agrees with Pliny's directions in his *Natural History*,[11] to mark the garden out in plots, 'border these with sloping rounded banks, and surround each plot with a furrowed path to afford access for a man and a channel for irrigation'. The smaller ornamental peristyle gardens commonly revealed evidence for fruit trees such as figs, olives, citrus fruits (lemons and citrons), and possibly cherries, pears or apples. The last three are depicted in wall paintings, but their root casts are difficult to distinguish, one from another.[12] Behind the House of the Ship Europa, a large enclosed area was interpreted as a combined market garden and orchard. A slightly raised path running down the centre of the garden gave access to two vegetable plots, one with nine narrow beds separated by irrigation/path furrows, and the other with five beds. The surrounding area revealed the root cavities of young vines planted about 4½ Roman feet apart, and other trees such as olive and filbert. Broken plant pots were recovered in one area of the garden, at the base of tree planting holes. This suggests that container-grown trees were sometimes brought into the garden for planting out. Plant remains included pieces of filbert shells, a carbonized fig, grape seeds, an almond fragment, and numerous carbonized horse beans. Jashemski argues that the modern practice of intercropping vineyards with horse beans was also in operation in Roman Pompeii.[13] While there is no set pattern to the gardens of Pompeii, in so far as fruit trees might be found in small ornamental gardens, in mixed fruit and vegetable areas, or in orchards, three important features of kitchen gardens are evident: they are enclosed, they are associated with houses, and provision has been made for watering them, with cisterns and channels.

Roman kitchen gardens and the cultigens described by Pliny, Columella and other authors can hardly be described as being in a formative stage. The large number of *Brassica* and *Allium* types, and the many varieties of lettuce in cultivation indicate a long period of collection and subsequent selection before this time. Their horticultural

techniques which involved transplanting, the taking of cuttings and offshoots, grafting and layering of fruits, deep digging, the use of raised beds, manuring with different types of dung for particular purposes and even cucumber boxes which could be wheeled under mica-glazed frames, also give the impression of being part of an already mature tradition.

The Roman authors make frequent reference to Greek writers on kitchen gardening, especially Theophrastus (*c.* 370–278 B.C.). While drawing much material from them, it is still evident that the Romans made important contributions both to cultivars such as cabbages and kale, and to cultivation techniques. From Theophrastus's *Enquiry into Plants*[14] and a contribution to the Hippocratic Corpus, *Regimen II*[15] composed about 400 B.C., we can assemble yet another list of kitchen garden vegetables for the period some four centuries before Pliny and Columella. As in Rome, leafy vegetables included beet, blite, cabbages and kales, lettuce, orach, purslane, rocket, patience/sorrel, and the parsley/celery group. Endive does not seem to be present, but its wild form, chicory, was used as a pot herb. The mallow appears as a wild plant suitable for cooking. Garden root vegetables seem to have been fewer than in Roman times, chiefly radish, turnip and beet. The latter had a long straight root described as fleshy and sweet. Leeks, garlic and many different kinds of onions were described, in addition to several types of cucumber, bottle gourd and possibly the melon. A similar and equally extensive range of flavouring plants were grown as in Roman kitchen gardens, with an emphasis on basil, coriander, cress, cumin, dill, marjoram, mustard and savory. Many herbs and aromatic plants were gathered wild. Techniques of propagation involved striking cuttings, sowing seed at various seasons, root division, and separation of offshoots. Theophrastus had a detailed knowledge of seed germination times[16] which was copied with very few modifications by Pliny.[17] As in Pompeii, terracotta plant pots have been recovered, in this case from three foot square tree planting holes cut into bare rock at the Temple of Hephaistos in Athens.[18] Once again we gain a strong impression of a well established horticultural tradition.

The obvious question which arises from this impression is, when did this classical tradition begin? We might also ask which cultures were responsible for the development of the tradition from its shadowy beginnings to its fully fledged classical form (which in turn profoundly influenced the kitchen gardens of later western cultures). There can be little prospect of preparing as coherent an account of the rise of kitchen gardens and the domestication of vegetables as is available for cereals or legumes, owing to the scarcity of plant remains and garden excavations. Archaeologists have been understandably preoccupied with houses, temples and city walls rather than the often ambiguous traces of buried cultivated soils nearby, which may represent the sole evidence for ancient kitchen gardens and orchards. Nevertheless, what evidence there is, is worth synthesizing and leads to some interesting hypotheses.

PRE-CLASSICAL KITCHEN GARDENS AND PLANTS OF THE FIRST, SECOND AND THIRD MILLENNIA B.C.

Homer's evocative description of the Gardens of Alkinoos[19] deserves to be quoted in full since it represents an idealized fruit and vegetable complex of the early first millennium, and stresses once again the three important characteristics of enclosure, proximity to the house and continuity of water supply.

> Outside the courtyard but stretching close up to the gates, and with a hedge running down either side, lies a large orchard of four acres, where trees hang their greenery on high, the pear and the pomegranate, the apple with its glossy burden, the sweet fig and the luxuriant olive. Their fruit never fails nor runs short, winter and summer alike. It comes at all seasons of the year, and there is never a time when the West Wind's breath is not assisting, here the bud and here the ripening fruit; so that pear after pear, apple after apple, cluster on cluster of grapes, and fig upon fig are always coming to perfection. In the same enclosure there is a fruitful vineyard, in one part of which is a warm patch of level ground, where some of the grapes are drying in the sun, while others are gathered or being trodden, and on the foremost rows hang unripe bunches that have just cast their blossom or show the first faint tinge of purple. Vegetable beds of various kinds are neatly laid out beyond the furthest row and make a smiling patch of never-failing green. The garden is served by two springs, one led in rills to all parts of the enclosure, while its fellow opposite, after providing a watering place for the townsfolk, runs under the courtyard gate towards the great house itself.

It is unfortunate that Homer did not specify the types of vegetables as he did of fruit. Indeed Forster[20] noted that in both the *Iliad* and *Odyssey* only fifty plant names are mentioned. Many of these are of trees and shrubs. Only the onion can be assumed to be a garden vegetable. The term for parsley/celery is applied to a plant used as food for horses, and as crowns of victory in the Isthmian games.[21] It may well have been gathered wild.

The tablets from which Mycenaean economic activities have been reconstructed for the period around the thirteenth century B.C. are, as Chadwick[22] has stressed, administrative records of royal palaces, dealing with produce of particular interest to the king. Actual plant finds are relatively rare and artistic representations show flowers and trees not vegetables. However the tablets indicate that extensive use was made of herbs and aromatic plants for cooking and perfumery. While some were probably imported, those listed in large quantities are assumed to have been grown locally and include coriander, cress, cumin, fennel, mint, parsley/celery, and safflower.[23] Since figs, grapes, and olives were important tree crops, we can assume that orchards and vineyards were present. Chadwick drew attention to the practice still seen in Greece of growing cereals on the land between olive trees.[24] Whether or not the herbs and aromatic plants grew in close association with vine and figs, or in separate plots or fields, cannot be determined. If Homer's notion of a mixed orchard, vineyard and vegetable garden reflects a long established pattern, then we can take the beginnings of orchard husbandry in this region towards the end of the Neolithic period (*c.* 3000 B.C.)[25] as a possible starting point for kitchen gardens as well.

The best evidence for kitchen gardening in the Mesopotamian cultures of the first millennium is a tablet dating to the late eighth century B.C. describing the contents of the garden of King Merodach Baladan.[26] A total of sixty-seven plants were listed in fourteen groups, with from three to seven members in each group. Whether each group was equivalent to the contents of a single 'bed' is uncertain. Though some plants seem to have been grouped by similarity in appearance or use, this is not invariably the case. A critical assessment of the names, accepting only those with reliable Aramaic and/or Syriac cognates, allows us to identify with reasonable certainty only twenty-six of the plants. The same criteria were applied to the names of vegetables and 'hot' plants listed by R. Campbell Thompson in his *Dictionary of Assyrian Botany*[27] which cover the period from 1400 to 600 B.C. A further source of vegetable names is the list of ingredients for a

consecratory feast given by the Assyrian King Ashur-Nasir-Apli II who lived in the ninth century B.C.[28] Together these sources allow us to assemble yet another list of culinary vegetables and herbs. Leafy vegetables included sea-blite (*Suaeda* sp. and possibly other salt-tolerant species), lettuce, purslane and rocket. Their root vegetables were a type of beet, the radish and the turnip, the same as for the Greeks. The *Allium* cultigens were leek, garlic, and several types of onion, possibly including the shallot. Cucumbers, gourds and the bitter colocynth were grown. Flavouring herbs were the ammi (*Ammi visnaga*), cardamom (*Elettaria cardamomum*), coriander, cress, white and black cumin (*Cuminum cyminum* and *Nigella sativa*), dill, fennel and/or anise, fenugreek (*Trigonella foenum-graecum*), marjoram-origanum, mint and/or pennyroyal, rue and thyme. The black or green gram bean of Indian origin was an interesting entry in the garden list of King Merodach Baladan. Nearly a thousand years before, about 1750 B.C., Mari and Karana palace provisions frequently included several types of onion and garlic, ammi, black and white cumin, fenugreek, mustard, saffron (?*Crocus sativus*), and quite large quantities of coriander.[29]

When we acknowledge just how many plant names cannot be securely identified in the Merodach Baladan garden list, but by their context were obviously a mixture of culinary and medicinal plants, we cannot categorize Assyrian gardens as being any more 'formative' than those of Classical Greece. Nor can we weave arguments about the absence of such classes as cabbages and kales, while so many plants remain unidentified, both in the garden lists and feast provisions. As an example, at the feast given by King Ashur-Nasir-Apli II, a thousand boxes of 'greens' were consumed, along with three hundred containers of mixed *raqqatu*-plants, one hundred containers of *karkartu*-plants, and a similar quantity of *tiatu*-plants, all unidentifiable.[30] In numbers of cultigens alone, the Mesopotamian gardens of the early first millennium may have rivalled those of Classical Greece and Rome. Technologically they must have been part of elaborate irrigation systems, such as that constructed by King Ashur-Nasir-Apli II, leading to the palace and temples of ninth-century Kalach. He wrote:

> I dug out a canal from the Upper Zab, cutting through a mountain at its peak . . . I irrigated the meadows of the Tigris (and) planted orchards with all (kinds of) fruit trees in its environs . . . The canal crashes from above into the gardens. Fragrance *pervades* the walkways. Streams of water (as numerous) as the stars of heaven flow in the pleasure garden.[31]

Among the plants in the pleasure garden were pomegranates and vines, so we can assume that there was no strict segregation of ornamental and productive fruiting plants.

It is important to recognize the discrepancy between plants identified from the ninth-century tablets and those recovered archaeologically from the seventh/eighth-century sites of Nimrud and Fort Shalmaneser. The large quantities of plant remains identified by Helbaek were chiefly from grain storage jars and wells, and are predominantly cereals, legumes, and what are presumed to be weeds of the fields.[32] A few date and olive stones, hazelnut shells, fig and pomegranate seeds, and a somewhat larger quantity of grape pips and prosopis seeds indicate consumption of 'fruit', but the only indication that vegetables were also part of the diet was the discovery of two cucumber seeds in a well. We know independently that kitchen gardens existed, and that a wide range of culinary plants were grown in them, yet a host of cultural practices

relating to storage, stage of growth at the time of consumption, and seed size, rule out the recovery and identification of vegetables from archaeological sites. We should not forget that this situation may apply equally to prehistoric periods when there are no tablets to redress the bias in the archaeological record towards cereals, legumes and large-seeded fruits.

Our knowledge of Egyptian kitchen gardens, their contents and horticultural techniques, is considerably greater because of excellent conditions of preservation of actual plant remains, and because so many aspects of Egyptian life were recorded in tomb models, wall paintings, relief carvings, papyri, and inscriptions cut into rock. Since the key cereal crops of barley and emmer wheat figure prominently, there has been a tendency to assume that other plant foods occupied a very minor role in the agricultural system, or were gathered wild. For the wealthy occupants of third and second millennia tombs, however, variety in funeral offerings almost certainly reflected a wide-ranging diet in their life times. Among the shrivelled remains of fish and meat, cakes of dates and barley, loaves of barley and wheaten bread, dried fruits, legumes and beverages, archaeologists have identified onions, garlic, radishes, coriander and cumin seeds.[33] Even the leaves of a type of celery (probably wild) have been found woven into a garland dated to about 1200 B.C.[34]

Naturally sugary, fibrous, or firm plant parts such as dried fruits and seeds, have survived entombment much better than soft, watery fruits or fleshy leaves; so we are dependent on the paintings and reliefs for evidence of green vegetables and watery fruits. Although there is disagreement over the antiquity of plants such as the beet, *Colocasia*, artichokes, asparagus, turnip, and cabbage, there is little doubt that the upright lettuce (like the modern cos) and the kurrat leek were grown as early as 2400 B.C.,[35] and types of melon, gourd and cucumber at about the same time. During the second millennium, garlic, onions and radishes are also present.

Since both fruits and vegetables were of great importance to the wealthy, we must consider just where they were grown and how they fitted into the economic system. Figs, grape-vines and other fruiting trees would naturally require separate plots from cultivated cereals, and these may have been enclosed by walls or earthen banks to keep out browsing animals and thieves. Representations of enclosed ornamental gardens with fruit trees planted round a central pond are known from a Theban tomb of the period 1420–1375 B.C.[36] These practical reasons suggest that some kind of orchard should have been present in Egypt as early as grapes and figs were taken into cultivation. Breasted cited a record of a fourth dynasty noble's walled estate in the Delta in which 'fine trees were set out, a very large lake was made . . . figs and vines were set out'.[37] Raisins and grape pips have been recovered from tombs as early as the first dynasty.[38] It is possible that the vegetables were grown beneath the trees or between rows, a practice described in the third century B.C.[39] Estate vineyards in the Fayum at this time were planted with melons, onions and garlic, and the vine-dressers gained additional income by selling the surplus vegetables. But we should note that these gardeners were mostly Greeks and were probably perpetuating the practices of their homeland. At much earlier periods in Egypt, there is good evidence that lettuce and leek plants were grown in separate vegetable plots.[40]

The plots are depicted as a rectangle containing many small squares laid out in chequerboard fashion. The grid probably represents shallow, intersecting channels

along which water was poured to reach the maximum number of plants. One of the earliest, in the tomb of Mereruka dated to about 2300 B.C., shows three men carrying water in jars to irrigate the plot, and gardeners with pointed sticks working at the bases of lettuce-like plants growing on short stalks.[41] A much smaller chequerboard plot (3 × 3 squares) on which three cos-like lettuces are growing is carved in the Chapel of Senusret I at Karnak, dated to about 1970 B.C.[42] This reappears in at least three other places in the Chapel.[43] In Tomb Three at Beni Hasan dating to about 1900 B.C. there is a representation of a plot made up of 14 × 4 squares with a dot in each depicting a plant. Two men carry water jars and another is emptying a jar on to the garden. A gardener squats on the plot beside them with a pointed stick like the dibber used in Britain for planting leeks. Beside him (but not actually in his hand as Klebs's[44] and Huxley's[45] figures derived from Cailliaud show) are two bundles of vegetables, the lower looking like small leek plants ready to be set out.[46] The tomb of Djehutihotpe (number two at El Bersha) dating to about 1875 B.C. also has a representation of a chequerboard garden being watered from jars, as well as a squatting figure with a pointed stick. Beside it, grapes or melons hang from a vine trained over a frame.[47]Another garden scene dated to about 1470 B.C. from the temple of Hatshepsut at Deir el Bahari depicts a chequerboard plot with lettuces growing.[48] In the fifth dynasty tomb of Niankhkhnum and Khnumhotep (*c.* 2375 B.C.), pointed sticks are shown being used at the base of leafy, lettuce-like plants, but the chequerboard pattern does not appear.[49]

A knowledge of the conventions for depicting gardens in the third and second millennia only indirectly helps us to interpret the scene of the important carved mace head found at Hierakonpolis and dated to *c.* 3100 B.C.[50] The 'Scorpion' King is shown with a hoe in his hand over-looking the junction of water channels which flow around two pieces of land, on one of which stands either a fenced enclosure made of upright sticks secured with cross pieces, or a rectangular plot divided into four strips. Although they are not in grid pattern, fine lines running at right angles to the strip boundaries may represent shallow furrows. Surmounting the plot or fence, in the same position as the lettuces of later paintings, is a palm tree. This scene is accepted by Butzer[51] as the earliest evidence in Egypt for artificial irrigation by controlling the flood waters of the Nile which reached Egypt in August or September. In this interpretation we see that the king has just used his hoe to open the channel around the rectangular plot. We cannot be sure, however, if the picture is of a vegetable garden, fields intended for cereal agriculture, or merely a fence around a palm tree. The normal pattern of land use in dynastic Egypt was 'winter agriculture, largely confined to the flood basins'.[52] Butzer also notes that

> The numerous pictorial representations all agree that seeds were broadcast on unprepared soil, rather than planted in plough furrows or hoe-turned beds. The limited use of plough and even hoe preparation in Islamic times . . . suggests that manual preparation was restricted to drier locales or horticultural plots.[53]

If we follow his interpretation, then we must conclude that this well-watered plot was planted at the same time as the winter cereal crops. There is an important difference, however, between this plot and the gardens represented in later wall paintings and reliefs. Because they are being supplied with water from jars, or by the Amarna period (*c.* 1340 B.C.) by the shaduf (a pole and bucket lever capable of lifting water up to three metres), they must be spring and summer gardens cultivated at a time of the year when

the ground water-level has fallen considerably. Thus we may be dealing with a gradual intensification of gardening, from winter plots on levées associated with settlements and palm groves, and watered from shallow flood-water channels, to all-the-year-round gardens and orchards irrigated by controlled flood waters in autumn and winter and by jars or shaduf buckets in spring and summer.

From such pictorial evidence the existence of separate vegetable gardens must be accepted for Egypt from the third if not the fourth millennium B.C. Unfortunately, only one complex of gardens has been excavated, and this, at El-'Amarna, existed much later, at about 1350 B.C.[54] The archaeologists found that the larger houses in the city had private walled pleasure gardens, usually with a kiosk (probably a garden altar) and pool surrounded by trees and shrubs.[55] The North Palace had a much larger pool garden. In one of the residential parts of the palace thought to have been the women's section, they found a small courtyard with columns around three sides: 'In the centre was a sunk garden with a low parapet wall round it and steps leading down to the beds which are divided up into squares.'[56] A channel ran round the edge of the beds bringing water from the central pond of the palace. Although this was interpreted as a flower garden, the watering system and layout have much in common with the lettuce and leek plots described earlier. At this site a broken terracotta pot was found at the base of a tree-planting hole,[57] considerably pre-dating the finds from Pompeii and Athens.

Important evidence for consumption of vegetables by craftsmen as well as nobles can be found in accounts of transactions kept by tomb builders in the period 1300–1100 B.C.[58] Two words, *smw* and *w3d* were used for vegetables in the price entries, and these occur frequently.[59] Individual vegetables such as leeks, lettuce and onions are seldom itemized and it is thought that they were included under the overall terms. The quantities are large and must indicate that vegetable production was an important economic activity supplying different classes of people. Royal gifts to the gods at the same period reinforce this suggestion, since they involve literally thousands of bundles of vegetables.[60] It has been suggested by Helck that vegetables grouped together as *smw* were planted in gardens, while *w3d* were grown in fields. Although Janssen[61] does not believe that the distinction was used consistently by the Egyptians, it would be reasonable to expect that green leafy vegetables like lettuces and leeks would be grown in gardens, while leguminous plants like chickpeas, peas and lentils in small fields comparable to market gardens.

Many matters concerning the types of vegetables grown in dynastic Egypt will always be subject to dispute, because of the nature of artistic representations and the problems of identifying plants from the hieroglyphs. We can be certain, however, of the existence of vegetable gardens and orchards from the third if not the fourth millennium B.C.

THE PREHISTORIC BEGINNINGS OF KITCHEN GARDENING

For the reasons discussed earlier, we can expect little direct evidence of kitchen garden plants, and once we step back into the pre-literate cultures, one of our most important props, written plant names, is removed. Apart from finds of onion bulb scales, a garlic bulb and garlic cloves in what is described as a Chalcolithic context (*c.* 3500–3000 B.C.) at the Cave of the Treasure near the Dead Sea,[62] and the recovery of what are thought to be

kurrat leek remains in Early Bronze Age Jericho,[63] there are no unequivocal records of cultivated 'vegetables' before 3000 B.C. The discovery of garlic in such an early context is particularly important for it could only be grown from cloves or inflorescence bulbils[64] and this would mean that it would be subject to the very operations which characterize horticulture. The kurrat leek find is also significant for its green leaves are customarily cropped over a period of fifteen to seventeen months, the number of cuttings depending on the amount of water and manure supplied to the plot.[65] Thus, neither garlic nor kurrat leek could be treated as agricultural crops, since one is vegetatively reproduced, and the other requires water throughout the year to maintain productivity. Since they occur in fourth millennium sites, we must accept the existence of horticultural plots, possibly kitchen gardens attached to houses, or mixed vegetable gardens and orchards. Given the typical pattern of close-packed room complexes in early Near Eastern towns and villages, and the necessity for irrigation, we expect that vegetables would be grown in garden-orchard enclosures around the margins of the settlements.

The rise of orchard husbandry may in fact be closely connected with the origins of kitchen gardening. According to Zohary and Spiegel-Roy,[66] olives were in cultivation at Teleilat Ghassul, north of the Dead Sea, in the period 3700–3500 B.C., while early signs of grape cultivation are evident in finds from Early Bronze Age Jericho. The cultivated date was also present at Teleilat Ghassul, with an even earlier find in an Ubaidian horizon at Eridu (*c.* 4000 B.C.). Fig cultivation is thought to have gone hand-in-hand with that of the olive and grape. The pomegranate may have been a component of fourth millennium orchards supplying Jericho, since its wild form does not occur anywhere in the Levant. Zohary and Spiegel-Roy[67] stress the fact that domestication of these fruits represents a shift from sexual reproduction to vegetative propagation, by cuttings in the case of grape, fig and pomegranate, by knobs growing from the olive trunk, and by offshoots of the date palm. The type of care given to these cuttings, such as regular watering, transplanting at particular growth stages, provision of shelter and supports, preparation of planting holes, and manuring, was directly transferable to kitchen garden vegetables. Thus if vegetable plots supplying leafy greens, the forerunners of root vegetables, cucurbits, *Allium* varieties, and flavouring plants, were not already in existence when fruit cultivation began early in the fourth millennium, they would have been a predictable development following soon after the creation of orchards.

The reverse situation may have applied, however: that the techniques which enabled the first domestication of fruit trees were learnt in vegetable gardens. A third possibility is that orchards and kitchen gardens evolved together. At this point we should ask what were the likely incentives for the creation of kitchen gardens? Increasing the locations in which the plant is available, and at the same time increasing its numbers, are obvious benefits to be obtained by cultivation, applicable to vegetables as well as field crops. More specific reasons can be advanced for cultivating the leafy vegetables. Since the majority are derived from wild annuals with a short growing season in spring before they run to seed, the advantages of cultivation would be to have them available close to the settlement, and therefore fresh, or to extend the length of time over which they could be harvested by making several sowings. To achieve success with an extended growing period the gardeners would need to supply water regularly to the plots, especially through the summer. Provision of animal manure, either deliberately or through

accidental association with dung in the vicinity of settlements, would rapidly improve the quality of the leaves by decreasing bitterness and enhancing tenderness, thus giving further benefits. As for the root vegetables, radish, turnip and beet, early forms may have been grown as annuals, and for their leaves and seeds as much as for their roots. Transportation to areas with cooler temperatures, in addition to attempts to grow them over extended seasons might have enhanced their biennial character and thus led to their increasing root size. The possible wild progenitor of beet (*Beta vulgaris* subsp. *maritima*) grows in the Levant as a leafy perennial weed of fields and roadsides.[68] *Raphanus raphanistrum* which is considered the likely wild progenitor of the radish is an annual weed of fallow and cultivated fields,[69] while *Brassica campestris*, the wild turnip, normally grows as a thin-rooted annual, but can be encouraged in as few as ten generations to become a bulbous biennial.[70] McNaughton[71] believes that true turnips originated in the cooler parts of Europe from biennial forms grown in warmer regions for their oily seeds. If he is correct, the early turnip of Near Eastern cultures may have been a leaf vegetable or a source of a pungent oil-seed.

The benefits of cultivating cucumbers, melons and gourds, would be an increase in fruit size from extra watering and 'feeding', and a greater harvest resulting from better protection from predators as the fruit ripens. Mature gourds were readily converted into containers, but in cultures with adequate supplies of pottery, the gourd's main function may have been as food while immature. Cultivation and selection of seed from the most palatable cucurbit fruits would lead to a gradual reduction in bitterness. As for the first cultivated members of the *Allium* group, the value of garlic, kurrat leek and onion in adding 'savour' to many types of dishes, would be a strong incentive to ensure plentiful stocks by cultivation and protection. In the case of the flavouring herbs and spices, while plentiful supplies could be gathered from wild aromatic plants like thyme and savory, which are readily dried and transported, there would be little reason to cultivate them unless grazing pressure had made them scarce. But culinary interest in the young leaves as well as the seeds of plants like dill, anise and cress, might have encouraged cultivation since the leaves quickly wilt when gathered. For those flavouring plants like mint, ammi, balm, and the parsley/celery group, which require moist ground, the irrigated garden represented the best means of extending their range closer to the kitchen. Other herbs, such as coriander and cumin, might continue as field weeds until increasing demand made them into specialist field crops. In the Levant today, the coriander grows as an annual among winter crops, along with fenugreek.[72]

In short, the benefits gained by cultivating vegetables close to the settlement, rather than gathering them from the wild, are immediate access to a greater variety, greater control of the quantities and, to an increasing extent, their season of availability, and the convenience of having close at hand certain plants needed daily or used as freshly picked 'greens'. To achieve these benefits the kitchen gardener must supply ample water and provide protection from strong winds and animals. Water shortage for much of the year was the factor which may have delayed the development of kitchen gardening in many parts of the Near East, and allowed cereal and legume culture to become economically dominant. Evidence for irrigation does not appear until the sixth millennium B.C.,[73] and this is not perennial irrigation but simply control and distribution of winter rainfall. Under such conditions vegetables could be grown only in the winter season and little

would be gained by bringing them together in a separate enclosure near the village. Nevertheless the era in which early dry-farming and simple irrigation techniques prevailed would also have seen an important stage in the transition from wild to kitchen garden vegetables. At this time, a number of leafy vegetables seem to have become field weeds, or inhabitants of disturbed ground beside paths and close to settlements. The evidence for this can be found in lists of seed identifications where the palaeoethnobotanist has included the weeds which accompany the cereals and legumes.

In the Mesolithic and early Neolithic levels at Tell Abu Hureyra,[74] quantities of *Polygonum*, *Rumex*, *Atriplex* and *Chenopodium* species were identified, as well as *Spinacia tetranda* (a wild spinach, probably not the ancestor of the cultivated form *S. oleracea*).[75] Several species of *Polygonum* have edible leaves, especially the old-fashioned garden vegetable, bistort (*P. bistorta*). Seeds of *P. lapathifolium*, *P. persicaria* and *P. convolvulus* were important components of the last meals of the Tollund, Grauballe, and Borremose men.[76] Nearly two thousand seeds of *P. aviculare* were deliberately collected by the Neolithic occupants of Sitagroi in east Macedonia,[77] and this species was also found at Hacılar.[78] Polygonum seeds possess a high starch content, and this coupled with edible leaves (in some species) may be the reason why the genus is commonly encountered. The *Rumex* seeds at Tell Abu Hureyra are not identified as to species. The only species cultivated as a vegetable in western Europe is the sorrel (*R. acetosa* and *R. scutatus*). However Zohary[79] describes some six species in the Levant of which the leaves are eaten in salads or cooked as potherbs: *R. vesicarius*, *R. cyprius*, *R. crispus*, *R. conglomeratus*, *R. pulcher*, and *R. bucephalophorus*. *Rumex acetosella* and *R. crispus* were identified in the stomachs of the Tollund and Grauballe corpses.[80] The cultivated orach (*Atriplex hortensis*) has several wild relatives with edible leaves, including *A. hastata*, *A. patula*, *A. portulacoides* and *A. halimus*.[81] One species of *Chenopodium*, *C. bonus-henricus* was grown in English kitchen gardens for its spinach-like leaves. Its abundant wild relative, fat-hen (white goosefoot — *C. album*) was used throughout Europe as a source of 'greens' and seeds. Zohary[82] notes that it was 'formerly cultivated as a bread plant because of its highly nutritious seeds; has a high vitamin C content and is used as a salad plant'. He also cites *C. opulifolium* and *C. murale* as being edible, the first as a potherb, the second as a salad herb. These chenopods are annual plants to be found today as weeds in irrigated crops, in gardens, roadsides, and refuse heaps.

The eighth/ninth millennium site of Mureybiṭ in Syria contains some *Chenopodium album* among its chenopod seeds, but is notable for the large quantities of *Polygonum ?venantianum*.[83] At Çayönü in south-east Turkey, a site dated to the seventh/eighth millennium, both *Polygonum* and *Rumex* species were present.[84] The Aceramic and late Neolithic levels at Hacılar[85] included *Chenopodium album*, two species of *Polygonum*, and the mallow (*Malva nicaeensis*). This species of mallow, together with *M. parviflora*, are described as potherbs by Zohary.[86] In the mid seventh millennium deposits of Can Hasan III, chenopods were again identified (including the fathen), in addition to a *Polygonum* species, a member of the Labiateae, and an Atriplex species similar to *A. lasiantha*.[87] At Çatal Hüyük large numbers of crucifer seeds were recovered from a deposit dated to about 5950 B.C. They were from the shepherd's purse (*Capsella bursa-pastoris*) and the salt-loving *Erysimum sisymbrioides*. Helbaek[88] believed that the seeds had been collected as a source of oil. An alternative use might have been as a

pungent flavouring spice similar to mustard which is also a crucifer. The young leaves of shepherd's purse can be used as a potherb in spring.[89] Seeds of shepherd's purse and those of *Erysimum cheiranthoides* were components of the last meals of both Tollund and Grauballe men.[90]

In the Khuzistan sites of Ali Kosh and Tepe Sabz which span the fourth to eighth millennia, the edible mallows (*Malva nicaeensis* and *M. parviflora*) become numerically important in the Mohammad Jaffar Phase (6000–5600 B.C.). The sea-blite (*Suaeda* sp.), a member of the Chenopodiaceae, is present in only small quantities. Helbaek[91] comments on the appearance of a large-seeded cruciferous plant, possibly a type of cress, at the beginning of the Tepe Sabz Phase (5500–5000 B.C.). He refers to it as an introduction by new people, but does not speculate as to whether it is a crop weed, unintentionally introduced, or a possible vegetable. It may be significant that its appearance coincides with the first evidence of irrigation in this area. In the Mesopotamian lowlands, the sixth millennium site of Umm Dabaghiyah produced thousands of seeds of the Chenopodiaceae.[92] Helbaek was able to identify among them the sea-blite (*Suaeda maritima*), and a type of saltwort (*Salsola* sp.), but the majority were unidentifiable. Although he initially believed that they had been brought to the site attached to plants for use as thatch or fuel, his footnote that sea-blite is collected and sold as a salad plant in Kuwait today showed that he now favoured the explanation that they had been brought in as food. In support of this is the note by Zohary[93] that the young shoots of *Salsola kali* are eaten as a potherb. Sea-blite was also identified in the North Mesopotamian site of Choga Mami,[94] where early irrigation is believed to be present (*c.* 5000 B.C.).

This brief survey of early farming villages and towns of the sixth millennium and earlier, should alert us to the possibility that some of the seeds commonly considered field weeds accidentally included with the grain and legumes, were of 'wild' vegetables of tilled fields and disturbed ground which were gathered as young plants to be eaten as salad greens or potherbs. Others may have been utilized in small quantities as flavouring plants, either as leaves or seeds. By habit, many of these plants became plentiful wherever man disturbed the soil, and those that invaded refuse heaps would have become noticeably larger and more succulent. In this way, close familiarity with the needs, responses and characteristics of a range of leafy vegetables and flavouring plants would have been built up in readiness for the time when some of them would be taken into cultivation as kitchen garden plants.

On nutritional grounds, the consumption of vegetables and fleshy fruits was a necessity at all periods. Early farmers may have derived the bulk of their fats, proteins and carbohydrates, from meat and seeds of legumes and cereals, but without regular consumption of leafy vegetables they could develop scurvy, a disease brought on by a deficiency of vitamin C. Few prehistorians have commented on this need, and in those publications where diet is discussed it is often implied that fruits such as capers would be sufficient. Since the recommended daily allowance of vitamin C for a moderately active man is 30 mg,[95] it would be very difficult to reach this amount outside the caper fruit season, on a diet of cereals, dried legumes and animal products. Each adult would have to drink nearly three pints of milk per day, which is obviously not a feasible way to obtain vitamin C in any culture. A five ounce (140 g) portion of cooked cabbage or turnip greens would be rather more realistic.

The development of kitchen gardens seems to have followed a prolonged period when leafy vegetables grew in association with cereals and legumes, in the fields, around their margins, and in waste ground close to the settlements. While this may have been a satisfactory method of producing potherbs and salad greens, some vegetables, such as garlic and onions, were not widespread wild plants or crop weeds. The same may have been true of certain flavouring herbs and aromatic spices. Once disseminated by trade, and an eager market created for them, their high value may have given the first impetus to the formation of kitchen gardens, protected, cared-for enclosures, supplied with ample water. More common vegetables of the fields could then have been included for convenience and to be grown over extended periods. If at the same time this process was occurring to superior varieties of olives, grapes and figs, a vegetable garden–orchard complex may have begun to evolve, possible as early as the fifth/sixth millennium. However full development of the complex in the drier regions would have been dependent on the provision of perennial irrigation. Since it is customary to classify gardens under categories like 'market', 'kitchen' or 'pleasure' gardens, the most appropriate term for this first garden enclosure might well be 'treasure garden', a reminder of the high value of the cultivars collected together and protected within its walls. I shall leave it to others to explore the implications of a Garden of Eden which grows, amongst its figs, large quantities of garlic.

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The Story of Spices[1]

JOHN W. PARRY

Editorial Note

As was stated in a review of this book (ECONOMIC BOTANY, July–September, 1954), every school child learns, presumably, that Columbus discovered America as a result of his effort to find a new route to the Indies, the lands of spices, but that the full significance of this statement, very likely, is appreciated by few. The importance lies in the fact that for two or three hundred years, beginning about five centuries ago, spices were of such great importance to the peoples of Europe that efforts to obtain them led to the greatest period of exploration the world has ever known, and to wars between nations contending for control of the routes to the sources of spices, once those sources had been found by the Europeans. Other groups of plants—food plants, drug plants and timber trees, to mention only three—have been of greater importance for the welfare of mankind, but none of them has had so great a world-wide influence on the political destinies of man as did spices. References to this role of spices are abundant in the popular literature on economically important plants, but nowhere else, at least in recent years, has the story been brought together and so admirably presented in delightful reading style as in this book. Excerpts, totaling 20 pages of the book, and abstracts of other parts constitute the following condensed version. So much more is contained in the book, however, that the student of ethnobotany, particularly of its historical aspects, will want to read the original in its entirety.

SPICES IN THE ANCIENT WORLD

" In the beginning, untouched and undisturbed save by the hand of God, the cumin and the anise of Egypt gave up their scent to the gentle Mediterranean breezes which cooled that arid land. In neighboring Asia, sweet marjoram grew and unknown monsoons brought rains to wet the cardamom and cinnamon of Malabar and Ceylon, while away in the volcanic islands of the Moluccas the fragrant cloves and nutmegs were fruiting on the mountain sides. How long it was before man, struggling through the mists of the primeval world, came to know and use these and all other aromatic plants, we cannot tell, but he must have gathered early the leaves, fruits, seeds, and roots of fragrant herbs common to his locality, and attributed to each a special virtue in his clouded scheme of things ".

" And so . . . began the uses and customs which have endured through the ages—spices for food, spices for healing, and spices to placate the gods ".

" Beyond these assumptions about the thoughts and practices of primitive man we cannot go. The stone implements and cave drawings tell us something about these early people and indicate the observing and inventive nature of their minds, but give us nothing on which to base the story of the spices in those very remote times. Not until after the passage of thousands of years did men develop a system of writing, and for the earliest records, we must go to the fertile valleys of the Euphrates, the Tigris, and the Nile ".

There we find the ancient cultures of the Assyrians, the Babylonians and the Egyptians. According to translations of tablets now in the British Museum, the Assyrian gods drank a wine of sesame which thus is the earliest mentioned herb on record.

" Sesame was a source of food, wine, and oil, and its production was a mat-

[1] 208 pages. Chemical Publishing Company, Inc., 212 Fifth Ave., New York 10. 1953. $4.50.

ter for royal supervision and attention . . . this seed was often a subject of contract and accounting, as is shown by the references to sesame on tablets and deeds now in the Babylonian room of the British Museum. One of these covers a loan of silver and sesame seed; another records an allowance of food, drink, and sesame seed . . . ; and still another covers a loan of silver and sesame seed . . . . There is also a tablet of accounts concerning dates and sesame seed. All belong to the 6th century before Christ ".

" Throughout the years of Babylonian history, sesame seed was highly prized for its practical uses. It found favor for the making of sesame cakes, dainties, wine, and brandy. Sesame oil was used as a food, in medicine, and in the preparation of toilet requisites. Its skin-soothing properties made it most acceptable for oiling the body, and it was an excellent vehicle for perfumes. Herodotus, Greek historian (c. 484–425 B.C.), said it was the only oil used by the Babylonians. And Theophrastus, Greek scholar and famed plant student (c. 372–288 B.C.), commenting on sesame oil, said it was ' specially receptive ' for the making of perfumes, and particularly rose perfume ' because of its viscid quality; and, when subjected to fire, it gives out a smell of sesame ".

" According to Herodotus, on one occasion sesame prevented the castration of a number of innocent boys. Periander, Tyrant of Corinth (665–585 B.C.), forcibly sent three hundred sons of noble Corcyraean families to Ayattes to become eunuchs. On their way to Sardis, their guards put in at Samos, and the Samians learning what was in store for the boys hurried them into the temple of Diana where they took sanctuary. Since the Corinthian guards could not enter the temple and take the boys, they stopped food supplies from reaching them. To prevent the boys being forced to surrender through hunger, a festival was originated by the Samians which called in part for choirs of youths and virgins to stand about the temple holding cakes of sesame in their hands which the unfortunate boys might snatch. The observance of the festival was kept going for so long a time that the Corinthian guards gave up their vigil and left the city, and then the Samians returned the boys to their parents in Corcyra ".

The Assyrians, a war-like people on both sides of the Tigris, established themselves about 3000 B.C., and among the 200 or so plants known to Assyrian doctors and chemists, the herbs cardamom, cumin, dill, fennel, origanum, thyme, saffron and sesame have been identified. And in the garden of one of the kings of Babylon, cardamom, coriander, dill, garlic, onion, thyme and saffron have been recorded.

" The aromatic plants were early employed in fumigation. It was natural that the sweet fragrance of the spices should have been associated with purity by the ancients. To them that which was foul-smelling would be a manifestation of evil, only to be combatted and overcome by the clean sweetness of the aromatics, and so, for cleansing purposes, the spices found great favor in the eyes of the priests. An early example of this might be that of Gudea, Patesi of Lagash (c. 2450 B.C.), who, in preparation for the building of a temple, purified the city by special rites and kindled a fire of aromatic woods to make a sweet savor for the gods. And it is probable that this was the beginning of the practice of using spices to fumigate the streets of cities before royal visits, and to ward off disease in times of plague as was done in Europe during the Middle Ages ".

" Spice plants played a part in many of the incantations, magical rites, and ceremonies performed by the priests in

behalf of those plagued with sickness or suffering from spells and bewitchments. In the second tablet of the Maklu series of Assyrian incantations addressed chiefly to the Fire-god, the performance of the ritual was to be accompanied by the burning of the flower of sesame. In the fifth tablet, mint and cassia play a prominent part. In the sixth tablet of the Sharpu series, addressed to the god Marduk in behalf of a man whom a demon had plagued with sickness, the priest was to cast into the fire a pod of garlic, certain seeds, and other substances. In other series of incantations, sesame wine, pleasant odors, and oils were to be set before the gods if the suppliants were to gain absolution and purity. On the occasion of the illness of the Babylonian king Shamash-shum-ukin (668–648 B.C.), twelve sesame cakes were called for in the incantation for the hand-raising prayer to Sin, the moon-god. He recovered only to burn to death later in his own palace ".

" In their way of life, the Babylonians were a people fond of magnificence. They consumed lots of spices, and the spice trade was a major and lucrative business in Babylon. To her markets, the spices made their way by boat and caravan from widely separated points, and the merchandising of spices and spice products in this ancient city was great enough to merit mention with her trade in gold, silver, and precious stones, in the 18th chapter of The Revelation of St. John the Divine ".

" The Egyptians believed the spirit returned to the body of the deceased, and, as far back as the 4th millennium before Christ, the bodies of kings and other highly placed persons were preserved against decay after death by a system of mummification which, in time, became quite elaborate. The spices first used in the mummifying process may have been anise and cumin, and perhaps sweet marjoram. Later, when cinnamon and cassia found their way into Egypt, these two barks were among the chief embalming spices ".

In describing one of the three methods of embalming, Herodotus tells us that the bodies of the deceased were filled with " the purest myrrh, cassia, and every other sort of spicery except frankincense ". He " does not mention the use of cassia or other spices in his description of the second and third methods of embalming which might indicate the high cost of spices, particularly those which had to be imported, in early Egyptian times. Cinnamon and cassia are not native to Egypt, and these spices could only arrive in that country after long transport and repeated handling, which must have made them very costly ".

" The ancient Egyptians, no less than their contemporaries in Mesopotamia, used the spices to make unguents, perfumes and holy oils. About 2500 B.C., Pharaoh Sankhkere sent ships to the land of Punt, which seems to have been the regions on both sides of the Lower Red Sea and the Gulf of Aden, and in 1500 B.C., the Egyptian queen, Hatshepsut, sent an expedition of five ships down the Red Sea to this land for aromatics. According to her records, the ships took on board a goodly cargo of ' fragrant woods of God's land, heaps of myrrh-resin, of fresh myrrh trees . . . cinnamon-wood, with incense, eye-cosmetic . . .'. All these fragrant substances were necessary in their way of life and for their rites and ceremonies. The dead were anointed with holy oils, and scented unguents had their place in Egyptian funeral ritual ".

Among numerous other references to the use of spices in the ancient world, Herodotus recorded that during the 20 years required to put together the 2,300,000 blocks of stone in the Great Pyramid of Gizeh, the 100,000 men who labored constantly on the project, and

were relieved every three months by a fresh lot, lived on a diet made up largely of garlic and onions in addition to radishes. And the Medical Papyrus of Thebes, written in 1552 B.C. and discovered by a German Egyptologist the latter half of the last century, lists several hundred remedies, among the identified plants of which are the names of coriander, caraway, sesame and saffron.

The ancient cities of Thebes, Memphis and Coptus for a long time were important as marketing and distributing centers for these spices. Eventually they were succeeded by the great city of Alexandria which became the leading emporium for trade in Oriental spices. It retained that position until the ascendency of the Portuguese in the 16th century A.D.

Spices in the Holy Bible

In the Holy Bible spices are mentioned in numerous places, especially in the Old Testament, both specifically and in general terms, beginning in the Book of Genesis, chapter 37, with the spice merchants who bought Joseph from his brothers in the year 1729 B.C. The final mention is in the 18th chapter of The Revelation of St. John the Divine where the fall of the great city of Babylon is foretold with its concomitant cessation of trade in " cinnamon, and odours, and ointments ". Between these first and last allusions are others to balm, myrrh, coriander, sweet calamus, stacte, onycha, galbanum, frankincense, cumin, mint, anise, cassia and cinnamon. A great part of Solomon's wealth was derived from " the traffick of the spice merchants ", and wealthy King Hezekiah of Judea owed much of his riches to " silver, gold, precious stones, and spices ". These various spices were employed to make food more palatable and in the preparation of perfumed ointments and oils for religious ceremonies. Of them all, cassia and cinnamon were held in highest esteem by the Egyptians and Hebrews.

Cassia and Cinnamon in the Ancient Middle East

" Cinnamon formed part of the aromatics used by the Egyptian queen, Hatshepsut, some 3,500 years ago, and . . . cassia was employed in ancient Egypt to embalm the dead . . . cassia and cinnamon were ingredients of the holy annointing oils and perfumes used in the ritual of the tabernacle erected by Moses in the wilderness of Sinai . . . cassia was in the market of ancient Tyre, and . . . cinamon was an item of merchandise in the old and magnificent city of Babylon ".

But cassia and cinnamon did not grow in Egypt or in the land of the Hebrews. The first is native to China and the East Indies; the second to Ceylon and the nearby Malabar coast of India. How, and by which people, then, did these fragrant spice barks first reach the Middle East? Some may have come to the Egyptians and Hebrews by overland caravans, but such journeys of thousands of miles over mountain ranges and across inhospitable deserts, through what today are India, Pakistan, Nepal, Afghanistan and Iran, renders it more likely that they were transported by some seafaring nation, especially those spices which came from the Molluccas of the East Indies. The only peoples who could have engaged in such extensive maritime commerce were the Arabs and the Phoenicians, and when the activities and history of both these nations are considered, the evidence is in favor of the former.

" In short: The Phoenicians were indeed notable manufacturers and great traders, but they produced no aromatics of their own and dealt in spices only as they dealt in every other kind of merchandise moving between East and West. They were renowned sailors and un-

doubtedly made long voyages to eastern parts of the world in later centuries, but nowhere in their maritime history are they mentioned as importers of cassia and cinnamon. Fundamentally, the Phoenicians were not spice merchants, but general merchants ".

" The South Arabians traded in aromatics from earliest times; other merchandise they also handled, of course, but spice trading was their mainstay. They were sagacious merchants, and long acquainted with sea trade ".

" It was to Southwest Arabia and the neighboring coastal land of Africa that Egyptians came for aromatics some 4,500 years ago; it was Arabian merchants who carried spicery from Gilead to Egypt some 3,666 years ago, and it was from Arabia that the ships of Hatshepsut sailed with cinnamon to Egypt some 3,500 years ago ".

" The South Arabians depended on the aromatic trade almost entirely for a livelihood. They traded their fragrant gums and resins in the Red Sea and in the Persian Gulf, and it is to be expected that they ventured on voyages of exploration in search of new spices to meet the growing demand in the Middle East for aromatics. We cannot point to them having made long coastal voyages to the East in very early times anymore than we could to the Phoenicians, but we can clearly see why they, rather than the Phoenicians, should have made such voyages. The cinnamon which was employed by the Egyptian queen, Hatshepsut, in 1500 B.C., and the cassia and cinnamon which the Israelites used in the rites of the tabernacle in 1490 B.C., all had to come from spice lands farther east, and it is only reasonable to conclude that these fragrant barks came into the Middle East by way of a spice-dealing people; and no people in all the Middle East excelled the Arabians as spice merchants ".

" The whole coastal region of Arabia from the Persian Gulf through Hadramaut to the Red Sea knew the traffic of the Arabian spice merchants. From her most ancient people, through the Minaeans and Sabaeans to the Himyarites, the aromatic trade of South Arabia endured. The Sabaeans sent their ships overseas for spices and, for centuries, these people successfully monopolized the trade in cassia and cinnamon between eastern spice lands and the Middle East. They cleverly concealed the true source of cassia and cinnamon, and traded these fragrant spice barks to great advantage in all the markets of the Middle East ".

" In conclusion: Spices were indivisible from the lives of the South Arabians; they were their heritage and their mainstay. South Arabians were traders and sailors from earliest times and, by necessity, must have sought new sources of spices to meet the great demand of Middle East peoples. Cinnamon was early associated with their name, and cassia and cinnamon were imported and distributed exclusively by them for centuries. There can be no doubt that they were the founders of the trade with Eastern spice lands which brought the first cassia and cinnamon to the Middle East ".

" So, through a chain of traders, the cassia of Cochin-China probably made its way to Southern India, or the island of Ceylon, from where it was conveyed, together with the Malabar cinnamon, in Arabian vessels to the Persian Gulf. Some cassia and cinnamon must have been landed at Oman and from there transported by camel train to Arabia Felix for the trade with Egyptians and Hebrews and some was carried to the head of the Gulf for transportation into Babylonia and Assyria by way of the Tigris and Euphrates rivers ".

The Arabian Spice Trade

" South Arabia became the great spice emporium of the ancient world, and South Arabians, the clever, mystifying

masters of a very lucrative trade in domestic and imported spices. It was not their intention to let outsiders learn too much about their activities, and to hide their trade secrets, they invented and spread some very fantastic tales, particularly in regard to the origin and production of the highly desirable and costly spice barks, cassia and cinnamon ". These weird accounts have been handed down to us by Herodotus, Theophrastus and Strabo, and appear to have been accepted by them. They held that the spices were produced in Arabia, an idea that prevailed until attacked by the Roman naturalist Pliny the Elder who claimed that 'Arabia produces neither cinnamon nor cassia' and then recorded and blasted the ancient myths. Pliny was wise to the wily Arabian spice merchants and knew that they had been bluffing all along; that they did not produce cassia and cinnamon in their country; and that for centuries they had told ridiculous stories in order to keep up the price of their barks. Erudite as he was, however, Pliny did no more than substitute one fallacy for another, for he claimed that " cinnamon grows in the country of the Ethiopians . . . cassia grows not far from the plains where cinnamon is produced "!

" Pliny also mentions ginger and cardamom as products of Arabia, and apparently he had heard that some cardamom grew in India, but actually he had no more idea of the true origin of these spices than he had of cassia and cinnamon. We can be sure that the Arabians imported ginger and cardamom together with cassia and cinnamon, and that all these spices were part of their great and wisely protected trade in overseas aromatics. Considering the nature of all four products, it is understandable why they traded in them to the probable exclusion of pepper, which they left to others. Pepper had little to recommend itself to the people of those days, if we judge by the disparaging remarks of Pliny which we shall read later, whereas the others had a desirable fragrance particularly suited to the nature and customs of the people of the Middle East ".

" Pliny contemptuously dismissed Arabia as the land of spices, but, nevertheless, Arabia was, in his day and had been for centuries before him, the spice emporium of the ancient world. Its trade was immense, lucrative, and well organized. The Arabs were astute and competent, and the hold they had gained on the spice trade before the days of Herodotus, they maintained long after the days of Pliny ".

Uses of Spices in the Ancient Greek and Roman World

" In war and peace, palace and hovel, temple and arena, fact and fable, the spices had their part in the lives of the people of the ancient Greek and Roman world. In preparation for the passage of the Persian armies, soldiers burned all kinds of spices on the bridges built by Xerxes across the Hellespont, during his war against the Greeks in the 5th century before Christ. The soldiers of Alexander the Great, marching through Gedrosia from India, used spice plants for tent coverings and bedding. Laurel leaves decorated the weapons of Roman soldiers and adorned their fasces; and in them, Roman generals wrapped their dispatches. In the social life of the ancient Greeks and Romans, spices were the essence of personal luxury; and an important part of public functions, banquets and parties. Cardamom, cassia, cinnamon, and sweet marjoram were among the ingredients of their perfumes; and anise, basil, fennel leaves, coriander, and garlic were among their aphrodisiacs. Spice-scented oils to soothe the skin were a part of the routine of the bath, and used by athletes to anoint the body. Their wines were flavored with spices, and among their kitchen implements, they had mortars

and pestles in which to pound and powder the spices they used in cooking. Laurel leaves formed the wreaths with which the victors in the sacred games were crowned. Costly spices were among the most desirable of gifts, just as they had been in the days of Sheba and Solomon; cassia and cinnamon, for example, formed part of the royal gift presented by Seleucus I to the temple of Apollo at Miletus. Spices, and oils perfumed with spices, were placed in the temples for the acceptance of the gods. Spices were an important source of revenue for the royal coffers, and in the time of the early Ptolemies, their import was under royal control, as was also the manufacture of scented preparations from them, and the extraction of sesame oil. In medicine, the spices were used to heal the sick and the wounded; and they were employed lavishly in the funeral rites of prominent people ".

" Most of the spices used by the people of today were known to the ancient Greeks and Romans. Anise was used in the kitchen for the making of seasonings, relishes and sauces, and together with cumin in the making of a cake which was customarily eaten by the Romans at the end of a meal to prevent indigestion. They considered aniseed excellent for flavoring wine. It was used to sweeten the breath, promote the appetite, as an aphrodisiac, and also as a moth repellent. In Pliny's day, the most esteemed anise was that of Crete, with Egypt supplying the next best in quality. Sweet basil was probably used for culinary purposes in those days, but all we know for sure is that it was used as an aphrodisiac, ' for which reason ', says Pliny, ' it is given to horses and asses at the season for covering '. Caraway was principally employed for culinary purposes. Cumin found favor as a food seasoning and, with coriander, it was employed for preserving meat. Fennel was extensively employed in seasonings and to flavor sauces made with vinegar. The leaves of fennel found favor as an aphrodisiac. Garlic was a popular food and seasoning. According to Pliny, it was a dish of ' high rank ' to the rural population of Africa. Beaten up with coriander, and taken in pure white wine, it was also used as an aphrodisiac. Ginger was employed in the kitchen to flavor meat dishes and to season relishes and sauces. Mint was a favorite food seasoning, and was used to flavor meat sauces. It was added to milk to prevent its turning sour, and to keep it from curdling. Like aniseed, it was employed to flavor wine. Peppermint sprays decorated the banquet tables, and both Greeks and Romans crowned themselves with it at their feasts. Mustard was a condiment, used, it would seem, in much the same way as we employ it today. Thyme was employed to flavor cheese and liquor. It was also used for fumigating ".

" Both black and white pepper were employed in the kitchens of the ancient Greeks and Romans. When pepper first came into use in those parts, we do not know, but Theophrastus spoke about two kinds of pepper some 400 years before the publication of Pliny's *Natural History*. Pliny distinguished between black and white pepper and observed that the black ' is of a more agreeable flavor; but the white pepper is of a milder quality '. He did not have a very high regard for this spice ".

In the realm of superstition and medical application the ancients entertained some strange notions about spices, and attributed weird and specific properties to each kind of spice. " Many of the fantastic claims, made for the medicinal virtues of the spices in those days, endured through the centuries to find their way into the leechbooks and herbals of the Middle Ages, and some have endured until this day ".

Spices in the Early Christian Era and Middle Ages

" In the closing centuries of the pre-Christian era, sea trade between the Middle East and India began to increase rapidly. We have seen that the Arabians enjoyed for centuries a monopoly of the trade in Eastern spices which had not terminated by the time of Pliny. They were able to keep secret the true source of cassia and cinnamon, but it is not likely that they were able to keep secret the long voyages they were making to the East. Their trade expeditions must have been known to the international traders of Alexandria, even if the nature of their cargo was not. And it is certain that these merchants were watching them very carefully, and making plans to get into the Eastern trade themselves. These plans seem to have matured during the reign of Ptolemy Philadelphus (285–246 B.C.). The ancient canal which connected the Nile with the Red Sea was reopened, permitting entry to the Arabian Sea of Ptolemaic ships and those of the merchants of Alexandria, and trade between Egypt and India began. By the time of Strabo, as we have seen, there were regular sailings of large fleets of ships from the Red Sea ".

An important factor in the development of this trade was the discovery of the monsoons, and both Arabians and Egyptians very likely took advantage of these favorable winds in traveling between their homelands and India. Until the ascendency of the Portuguese in the 16th century the Arabians remained active and dominant in the spice trade, despite their loss of a monopoly in the trade after the Romans conquered Egypt in the century before Christ and took over the sea trade started by the Ptolemies.

" During the first three centuries of the Christian era, trade between the Roman empire and the east, particularly India, became quite extensive, both by land and water. The spices of India made their way by the Red Sea to Coptus, Memphis, and Alexandria; and from Alexandria, they were distributed to Greece and Italy. The Arabians were actively engaged in this spice trade, and cinnamon, ginger, and pepper filled the cargo holds of their vessels. The demand for spices was very great, and to the Romans they were an important source of revenue. At the Roman custom house at Alexandria, imported goods were scrutinized and taxed, and cassia and cinnamon were among those on which tribute was levied ".

" By the end of the third century at the latest, the Arabians had developed direct sea trade with China, and, in addition to China's cassia, they were probably obtaining spices from Chinese merchants which had come from the East Indies. Envoys from Java were reaching the court of China during the Han Dynasty, 206 B.C. to A.D. 220, and it is most likely that as a result, trade was carried on at that time between the two countries. During the Han Dynasty, it was the practice for those addressing the Emperor to perfume the breath by holding cloves in the mouth, and the cloves had to come from the East Indies because they are not a product of China ".

The great importance of spices to the peoples of Europe in the following centuries is especially well illustrated by the ransom extracted from Rome early in the fifth century when it was besieged by Alaric, king of the Goths. Part of the ransom was 3,000 pounds of pepper, showing that this pungent spice was not less valuable than gold or silver, and that large quantities of it must have been reaching Europe at that time. In the Middle Ages, when the merchants of Venice waxed wealthy from their trade in Oriental spices and other goods, there were recorded in ecclesiastical literature

various gists of cinnamon, cumin and pepper. And in the 12th century there was a Pepperers' Guild in London.

Spices in the Travels of Marco Polo

The great tale of travel which Marco Polo, as a prisoner of war between Venice and Genoa in 1298, related to a scribe contains numerous allusions to spices, some in general terms, others specifically to sesame-seed oil, ginger, cassia, clove and pepper. Most important of these was pepper, and in the city of Hangchow, Polo related that the daily amount of this one spice brought in was 43 loads, " each load being two hundred and forty three pounds, or a total of 10,449 pounds "! Similar trade was carried on at other points. Kublai Khan, the emperor, derived a handsome profit from this immense trade, " and the spice merchants made a most respectable profit despite cutoms, freight, and other charges which amounted to fifty per cent of the value of the pepper cargo ".

" Of the spices noted on his voyage home from the Straits of Malacca, Marco Polo mentions cloves in the Nicobar Islands, oil of sesame in Ceylon, and an abundance of pepper, ginger, and cinnamon on the Malabar coast of India ".

" It is a strange and interesting thing that Marco Polo does not mention cinnamon when speaking of Ceylon. The finest and most fragrant cinnamon, from *Cinnamomum zeylanicum,* is native to Ceylon, but, for some unknown reason, its presence on the island seems to have remained unnoticed until the late 13th century when it is mentioned in the work of an Egyptian historian. In fact, apart from Marco Polo's reference to sesame, he does not mention spices at all when describing this island, yet the spice trade of Ceylon had been noted by previous travelers ".

" Marco Polo also tells us of the use of oil of sesame in Abyssinia; of the port of Aden, ' frequented by ships arriving from India with spices and drugs '; and of a city named Kalayati situated three hundred miles southwest of Hormuz, where many trading vessels arrive from India loaded with spices which they sell to great advantage ".

Spices and Their Uses in the Late Middle Ages

" By the 13th century the East Indies were the scene of a thriving trade in spices. Java was the principal spice-trading island, and Javanese traders brought the cloves, nutmegs and mace from the islands of the Molucca groups for distribution to the world. Numerous Chinese junks reached the coast of Borneo and, from there, traded among the clove and nutmeg islands. From Java, Arabian merchants sailed west with their ships laden with pepper, cloves, nutmegs, mace, cassia, and ginger, in addition to their spice trade with southern India; and Chinese merchantmen carried pepper, cloves, nutmegs and mace to the ports of China. The East Indies gradually eclipsed the Malabar coast of India as the most important source of costly spices, and both places attracted the princes and merchants of western Europe to bring, in the 15th and 16th centuries, the greatest and brightest age of discovery the world has ever known ".

" China continued to export her cassia, of which large quantities grew in Kwangsi province and Cochin China, to the west. Her ginger probably went no farther than neighboring Burma and the eastern provinces of India. Burma was not a producer of spices, but a consumer of no small account, if we believe the contents of an ancient inscription which says that the 13th-century king Narathihapate ate three hundred dishes of curry daily ".

" The consumption of spices was

steadily increasing in the west, and in the fairs of Europe and England, oriental spices were regularly obtainable. In 13th-century England, mace was four shillings and sevenpence per pound, ginger one shilling and sixpence, pepper one shilling, cassia tenpence, and cumin twopence. These were high prices in those days, but understandable when we consider the long and hazardous voyages and overland journeys from the East, and the number of hands through which the spices passed ".

" There is little mention of spices in the next century. In 14th-century England, spices were still exacted as tribute or taxed for certain purposes. For example, in the reign of Edward I, we find that anise was among the commodities taxed to raise the funds required to defray the expense of repairing London Bridge. A new guild of Pepperers was organized in London in 1345. The Pepperers were among the wealthiest of merchants, and one had to be a pepperer of Soper Lane or a spicer of Cheap, in good standing, to belong to the fraternity. Cinnamon, pepper, and other spices were conveyed to the warehouses of the spice merchants by street porters, whose charges were a matter of agreement between themselves and the Pepperers Guild. Cassia buds were mentioned in this century: they were sold in London at eight to thirteen shillings per pound. Pepper increased in price to two shillings per pound ".

" Most decidedly, the spices were beyond the poor folk of those days, but the situation could hardly have been otherwise. All Europe depended on the Orient for pungent and fragrant spices: cloves, nutmegs and mace came from the Moluccas; pepper from southern India and Java; cassia from China and the East Indies; cinnamon from Ceylon and Malabar; and ginger from Malabar and perhaps the East Indies. And because there was no Suez Canal and no known road to the Orient, except through the lands of the Middle East, Europeans could not trade directly with those places ".

" The Arabs practically monopolized this trade in eastern waters, and the merchants and bankers of Venice controlled the spice trade in the Mediterranean. After leaving the hands of the native producers, the spices passed through numerous dealers before they reached the markets of the Black Sea and the Eastern Mediterranean, and with each change of ownership came an addition to the cost ".

" The balance of trade was in favor of the Orient, and to pay for the spices of the East, Europe shipped her gold and silver through Venetian banks, making the already wealthy merchants of Venice wealthier and adding to the fortunes of the royal coffers of the Middle East. But the people of the West were learning. Merchants and bankers in western and northern Europe were growing slowly more powerful; shipyards were building better ships; inquiring minds were busy; and eager, searching eyes were scanning the maps of the geographers ".

Preservation of food in those days depended on salting, drying and smoking, all of which must have resulted in very insipid food, the unpleasant flavor of which could be alleviated only by use of spices. " In the peasant home, we would not find the costly spices of the East. But in the kitchens of the great, every chef had his own ideas of seasoning and flavoring and every master his favorite spice. They used small, fragrant sticks of cinnamon and the delightful little clove buds to garnish dishes; pepper, cloves, ginger, mace, and onions stuck with cloves were common ingredients of pottage; clear soups were strained through bunches of fragrant herbs; anise, mint, and parsley were among the spices held best for gravies, sauces,

and relishes; dill flavored their vegetables and, in the later centuries, was used for pickling cucumbers; caraway and cumin flavored their soups; cheese, bread, and cakes were used in the preparation of dainties; fennel and coriander seeds were sugared and eaten as confections; oil was expressed from nutmeg and mace to flavor a dainty butter; cassia, cinnamon, cloves, nutmeg, mace, ginger, anise, sweet marjoram, thyme, and savory were employed to flavor puddings, tarts, pastries, cakes, and conserves; and rosemary, nutmeg, cinnamon, fennel, coriander, anise, cloves, and ginger went into the preparation of their many kinds of beverages, wines, and liquors ".

" Throughout the Middle Ages, the medicinal uses for the spices were not dissimilar from those of the ancients. The Anglo-Saxons turned to the herbs for most of their remedies, and in their leechbooks are found the names of many spices. In the *Herbarum Apuleii Platonici*, said to be a 5th century work, but published in the 10th century, we find mention of coriander, dill, fennel, mint, marjoram, parsley, and sage ".

The therapeutic qualities attributed to spices in the leechbooks and herbals of the Middle Ages were fantastic, and the importance of spices toward the close of that period is carried down to us in at least three famous pre-Columbian books—The Canterbury Tales, the Decameron of Boccaccio and The Arabian Nights.

The Portuguese Seek the Spice Islands

" In the 15th century, the spice trade of the East and Middle East was dominated by Moslem merchants. Their Eastern pivotal points were Calicut, Colombo, and Malacca. In the Middle East, their greatest markets were Constantinople and Alexandria. Spices bound for Constantinople from India and the Far East went by way of the island of Hormuz in the Persian Gulf; those for Alexandria by way of the Red Sea and the ancient city of Mecca. In the Mediterranean, the Venetians were the undisputed masters of the spice traffic moving between Middle East centres and European points ".

" The Middle Ages had witnessed the steady rise of Venice in commercial and maritime importance. From her favorable situation at the head of the Adriatic, between East and West, she had been of strategic importance in the affairs of many nations, and had fattened on the territorial and trading concessions which she had exacted as her reward. Her merchants and bankers were in every sizable port in the Mediterranean and the Middle East, from her own great city and the ancient port of Alexandria to the glittering city of Constantinople. Genoa had battled her only to be defeated at Chiogga in 1380 and to lose what she had attained as a maritime power. Venice was predominant, absolute controller of the Mediterranean trade and she was detested by the powers of western Europe ".

The predominance of Venice in this very lucrative trade was destined, however, to be broken by various influences of the Renaissance, particularly by the voyage of the Portuguese, Bartholomew Diaz, in discovering the Cape of Good Hope. That same year Pedro de Covilham left Lisbon " and went east by way of Barcelona, Naples, Cairo, and Aden. At Aden, he embarked on a Moslem ship and crossed the Arabian sea to Cannanore, from where he went to Calicut. In Calicut, he saw large quantities of pepper and ginger and heard that other spices were brought there from more distant places. From Calicut he went to Goa and then to the island of Hormuz in the Persian Gulf, where he saw a great trade in spices. Having noted carefully all he had seen and heard in

India and at Hormuz, he returned to Cairo and sent a full report to Lisbon ".

From 1497 to 1499 Vasco da Gama and his valiant men became the first Europeans to reach India by an all-water route. They, too, " found Calicut the centre of a region producing cinnamon, ginger and pepper and, like Covilham before them, learned that many other aromatic and pungent spices came to this port from more distant spice lands ".

" When the news reached Venice, that city was shocked. Following on the discovery of Diaz, this voyage of da Gama was a serious matter. The merchants and bankers of Venice knew only too well what this news meant. Following the conquest of Constantinople by the Turks, the Venetians had brought their spices from the east by way of Egypt. Thus the news of the Portuguese success was equally shocking to the Egyptians. For the Sultan of Egypt, it meant the loss of the large revenue which he obtained from the movement of spices through his kingdom. Altogether, it was a bad day for the merchants and princes of Venice and the Middle East: Spices were making history "!

Christopher Columbus Sails West to Find the Spice Islands

Columbus did not have any botanically trained person with him on his visits to the New World in search of the spice islands of the East, and in his notes he much regretted his own inability to pass judgment on the profusion of new plants which he found. The only plants that suggested the spices of the Orient were the native capsicum peppers and a kind of bark, known today as " white cinnamon " (*Canella winterana*), which has a slight aromatic odor resembling that of true cinnamon. In some manner, however, he succeeded in persuading the King and Queen on the basis of this very meagre evidence that a second voyage in further search of the elusive spices would be worth the investment.

On his second expedition, on the island of Marie-Galante in the Leewards, " he found a tree whose leaves gave off the fragrant aroma of cloves. . . . There can be little doubt that the tree they found was a species of the genus *Pimenta,* native to the West Indies and adjoining mainland of Central America and belonging to the same family as the clove. It was, most likely, *Pimenta racemosa,* common to the Leeward and Virgin Islands, but it may have been *Pimenta officinalis* or allspice, which is much more abundant in the island of Jamaica. Being November, the tree would not be in fruit, and this is probably the reason why a conclusion was reached so quickly and the tree so promptly forgotten ".

" If the tree they found was an allspice tree, this would be the first European contact with a tree whose fruit has been one of the most desirable of all aromatic and pungent spices for over 300 years. Columbus was so eager to find spices that it is difficult to believe that the abundant allspice of Jamaica should have escaped his notice when he reached that island later in his explorations, yet this seems to be the case. It is understood that this spice was unknown to Europeans in Columbus's day and that Columbus could not inquire about a spice which to him did not exist, but had he found the natives using this spice or had he gathered it from the allspice trees of Jamaica, he would most certainly have carried it back to Europe as a new spice or, because he had ' no knowledge of these products ', as a species of clove since its aroma is similar to that of the clove. In the face of his repeated references to his lack of knowledge of plants, and spice plants in particular, it would not have been an unreasonable mistake for him to have

made. Later Spanish explorers were perhaps not better informed and they found the spice, but apparently thought it was a species of pepper and called it Pimienta, which accounts for its botanical name, *Pimenta officinalis,* and its other common names, pimento, Jamaica pepper, and clove pepper ".

When Columbus died in 1506 " he had not reached the glittering courts of Eastern empires, nor smelled the fragrance of the spices which grew on the tropical isles of the Eastern Sea. For him, there had been no aromatic and pungent cloves, ginger, nutmegs, or mace; no fragrant cinnamon or cassia, not even a decent pepper! But the spices of the East Indies had led him to the West Indies, and to the land of America where his name is honored ".

" The discoveries of Christopher Columbus opened the West Indies to the trade and commerce of the world and it was not long before the spices of the East were introduced into the West. Today, the world's finest ginger comes from Jamaica and the nutmegs and mace of Grenada are exported to all parts of America and Europe. The capsicum spices of the New World were introduced into the Old World, and today these useful peppers are cultivated in many parts of Europe, in Africa, India, East Indies, Japan, and other distant lands ".

The Portuguese Master the Spice Trade

After John Cabot, born in Genoa and later a citizen of Venice, made his vain attempts under English auspices to reach the land of spices by following a northern route to the New World, the Portuguese began to consolidate their gains acquired through da Gama. First, under the command of Pedro Alvares Cabral and confronted by some fighting and other difficulties, they established spice-trading factories at Calicut, Cannamore and Cochin on the Malabar Coast of India. " The new spice trade was definitely under the control of King Emmanuel, and the factories were royal factories manned by royal officers who dispatched the spices of India to Portugal in royal ships. The kings of Portugal were not different from the ancient kings of Egypt in keeping control of the all-important and highly profitable spice trade ".

In the succeding years of the early sixteenth century the Portuguese continued to strengthen their gains toward controlling the spice trade. They gradually superseded the Moslems, who had so long monopolized the traffic, and they finally brought complete ruin to Venice, first by discovering the prime source of her trade in spices—the famed Spice Islands of the East Indies—and then by controlling them. " The Portuguese lost no time in consolidating their position in the East Indies. They were securely entrenched at Malacca and effectively commanded the strait, and they built forts at Amboyna, Halmahera, Celebes, Ternate and Tidore, where they had spice-trading factories. They were not very successful in protecting their interests in the Banda Islands, and because of the persistent, and at times violent, opposition of the natives, they were not able to fortify adequately the large islands of Sumatra and Java. On the island of Sumatra, the Moslem natives doggedly fought the Portuguese for the control of the pepper trade of the island, particularly in the north. On the island of Java, similar conditions obtained. The hatred which existed between the Christian invaders and the Moslem defenders cannot be overemphasized, and almost everywhere they went, the Portuguese met with cunning, subterfuge and frustration, if not violence. But the Portuguese were not deterred and went steadily ahead with their program of exploitation of the East Indies. Native junks were

found in the south China Sea, along the coast of Borneo and the Banda sea and, in the interest of monopoly, the Portuguese resorted to all sorts of methods to curtail these island traders. They did not intend that any spices should leave the East Indies except in Portuguese ships ".

"From Malacca, the Portuguese reached out to Burma, Siam, China and Japan. Long pepper grew in the forests of Burmese Tanasserim, black pepper in Siam, but these countries did not export their meagre spices at that time, and the Portuguese saw them more as potential markets ".

" The Moslems and Venetians throttled, the Portuguese now held a strangle-hold on the spice trade in Europe. The price of pepper and other spices began to soar in all parts of Europe and resentment grew as strong against the Portuguese as it had grown against the Middle East monopolists before them. Other European powers sought a means of breaking the grip of Portugal on the spice trade of the Orient, and intrepid mariners presented themselves at the courts of Europe with plans which would carry them to the Spice Islands and open a way for these powers to share in the great spice wealth of the East. Magellan sailed for Spain; Drake, Fenton, Cavendish, and Lancaster, for England; and before the 16th century slipped into the past, Van Houtman for Holland ".

Magellan's Quest and Further Attempts by the British

In September, 1519, Ferdinand Magellan, spurned by his own Portuguese king, sailed under the Spanish flag to seek a westward route to the Indies. Two years and nearly two months later, after enduring untold hardships and discovering the Straits that were ever after to commemorate his name, two of his ships entered the port of an island called Tidore. By that event the famed Spice Islands were finally reached by a westward journey around the earth. Magellan did not live to see the acomplishment of his mission, for he had been killed in combat in the Philippines six months earlier.

This fateful event deprived Magellan of personally enjoying the glory that would have been his upon later returning to Spain, but it was fortunate for later generations that one Antonio Pigafetta, a member of his staff, survived the journey. Pigafetta was an Italian gentleman and scholar who kept a faithful account of all that he saw and heard, and it is to him that we today are indebted, not only for information regarding the terrific hardships of the expedition as a whole but more particularly for his description of the cloves, nutmegs, ginger and cinnamon which the survivors found in the islands that they visited. The crew bargained for these commodities and gave in exchange agreed upon quantities of cloth, scissors, knives, looking-glasses and articles of brass and copper.

Under the command of Sebastian del Cano, Magellan's ship Victoria returned to Spain with a load of spices three years after having departed on the journey that was to accomplish the first circumnavigation of the earth, to observe for the first time the gain or loss in time by such a voyage, and to reach the great spice emporium by following the setting sun. " The cloves were sold at a most handsome profit, and Charles V of Spain was well pleased. He honored Sebastian del Cano with a coat of arms which included in its arrangement two cinnamon sticks, three nutmegs, and twelve cloves. He also gave him a very good pension. The golden trail of the spices was more brilliant than ever "!

Next the British, spurred by Magellan's conquest, endeavored to reach the Spice Islands by the Northeast Passage, around the North Cape of Europe, and

by the Northwest Passage which, it still was hoped, lay some where in North America. While all this was going on, " the Portuguese were waxing fat from their prosperous spice trade in the East Indies. They had obtained a share in the trade of the Javanese city of Bantam, from where three and a half million pounds of pepper were shipped yearly to China and India, and they had successfully concluded treaties with the Sultan of Brunei which not only opened up the pepper trade of Borneo, but enabled them to follow a better route from Malacca to the Moluccas and trade with the island of Celebes. Malacca had become a great spice-trading centre, to where all ships, large and small, that sailed the East Indian waters were bound to go and pay customs to the Portuguese. From this port, the Portuguese monopolized the clove trade of the Moluccas and the nutmeg and mace trade of the Banda Islands. But they had never known real peace with the natives. In the great pepper land of Northern Sumatra, the Achinese king stoutly opposed them and successfully carried on trade in pepper and other spices with Moslem merchants from Mecca. Moslem traders in Java steadily sniped at their trade with the Spice Islands, and shipped cloves, nutmegs, and mace to the Red Sea. Portuguese rapacity brought about an uprising in the Moluccas and in 1574, their fortress at Ternate fell to the Moslems. Then, in 1579, Francis Drake came, not by a northeast or northwest passage, but in the track of Magellan. It was the beginning of the end of the Portuguese monopoly of the spice trade of the East ".

In September, 1580, Drake returned to Plymouth, England, in his famous ship, the Golden Hind, and brought with him a load of spices. Other Englishmen followed Drake in Britain's effort to reap profits from the lucrative spice trade of the Indies. " But it was not the English who broke the power of the Portuguese in the East Indies; they concentrated more on India. It was the Dutch. The merchants of Holland were an enterprising lot and they were every bit as keen as the London merchants to reach the Spice Islands. In fact, they were determined to get their share of the highly profitable spice trade; they were already at war with Spain and they were prepared to fight the Portuguese in the East Indies if necessary. In 1595, they supplied the ships and money to send an expedition to the East Indies under Cornelius Van Houtman, and in 1596, the shadow of the Dutch fell across the Portuguese in Bantam ".

The Dutch and the English

In 1597 Van Houtman brought home three shiploads of pepper and nutmegs. Only 89 of the 284 men who had sailed from Holland returned, so costly in lives had the expedition been as the result of scurvy and other hardships. " The success of Van Houtman fired the imagination of the people at home and stimulated the merchants of Amsterdam into immediate action. The pepper and cinnamon of Sumatra, Java, and Borneo; the cloves of Ternate, Tidore, Amboyna, and other islands of the Moluccas; the nutmegs and mace of the Banda Islands—all were now within reach. Ships were speedily made ready for the long voyage, manned with sturdy sailors, officered with competent, daring navigators, and staffed with discerning officials. In the year 1598, no less than five expeditions left Holland for the East Indies; all told, there were twenty-two ships, thirteen of which followed the Cape route, and nine attempted the passage through the Straits of Magellan ".

These expeditions " made a good impression on the native sultans, opened trading stations, and generally laid the foundation for the future domination of the East Indies by the Dutch. The spices were making history and it was a bad day for the Portuguese ".

" The story of the spices in the 17th

century is the story of the decline and fall of Portuguese power in the East and of the conflict between the Dutch and English for the mastery of the spice trade ".

As part of this struggle, and angered by the high prices demanded by the Dutch, the English established the famous East India Company for developing their part in the spice trade. In September, 1603, one expedition dispatched by this company " brought to England enough pepper to break the Dutch hold on the market .... We do not know what the market for cloves was at that time, but history records that a shipload of cloves purchased in the Spice Islands for £2,948 in 1606, brought the sum of £36,287 when sold in England two years later ".

In order to meet this threatening competition, the Dutch merchants of Amsterdam, who had been fighting among themselves as well as against the English and Portuguese for control of the trade, banded together and formed the equally famous Dutch East India Company. After battles with the Portuguese, the English and the natives, the Dutch merchants eventually gained control of the producing regions whence came the pepper, cinnamon, cloves, ginger, mace and nutmeg which they all were striving to monopolize. In 1621 they were in a position to change the name of Jacatra, on Java, to Batavia. Some time thereafter, " from the Dutch headquarters in Batavia, a directive was issued affecting the cultivation of clove and nutmeg trees in the East Indies. On all islands, except those of Amboyna and Ternate in the Moluccas and the Banda group, clove and nutmeg trees were ordered extirpated. This wilful destruction of trees, which require years to bring their spices to fruition, reduced the production of cloves, nutmegs, and mace to one-fourth of that before the coming of the Dutch to the Indies. This was the Dutch method of creating a scarcity of these fragrant and highly desirable spices to force their prices up in the European markets for the benefit of the directors and shareholders of the Dutch East India Company ".

At the close of the 17th century the Portuguese spice trade in the East Indies was crushed, the English were left with but a remnant of their former trade, and the Dutch were " the undisputed masters of the East Indies, reaping the wealth of a great spice monopoly. The demand for Eastern spices had steadily increased in Europe and the trade was perhaps the most profitable in existence at that time. The number of uses for the spices in flavoring food and beverages, in medicine, cosmetics and perfumery had multiplied. Spices were sought after by all who could afford them. As in ancient times, the spices made treasured gifts between people. They were also sometimes presented to state dignitaries on special occasions and in festive seasons; offered as political bribes; given as bonuses to the dockworkers who unloaded the spice ships; bequeathed in wills; and used as rent. The term ' peppercorn rent ' means today a nominal rent, but in those days it represented real value. Cinnamon was perhaps the most desired of all the fragrant spices, particularly the bark grown in Ceylon which had a value on the European market many times that of the Malabar product, or the cassia of the Far East. The trade in this spice was one of the most profitable of all to the Dutch East India Company, which did not hesitate to burn large quantities of the bark to keep its price high. Not only had the trading companies profited handsomely from their ventures into the East Indies, but the revenues of their respective countries had been materially increased by the import and export of pepper, cassia, cinnamon, cloves, ginger, turmeric, mace and nutmegs ".

" Halfway through the 18th century, the tide of fortune began to change for

the Dutch East India Company. There were many reasons for this, but the principal were the steps taken by the French and British to break the Dutch monopoly by introducing spice plants into their own overseas colonies, the loss of Dutch possessions in India, the export of spices from India by the English East India Company, the British blockading of Dutch East Indian ports, and piracy and smuggling in the waters of the Indies ".

" The Dutch had angered Europe by making her pay dearly for cloves, nutmeg, mace, and cinnamon through their rapacious policy of curtailing production and creating artificial scarcities of these commodities. For a hundred years they had enjoyed naval supremacy in the Indies, and kept the foreigners from their spice-trading ports. But monopolies of this kind can be very harmful to the monopolists ".

In the latter half of the 18th century, despite Dutch vigilance, the French succeeded in introducing cloves, nutmeg and cinnamon plants from the East Indies into the islands of Reunion, Mauritius and Seychelles in the Indian Ocean, and into French Guiana in South America. In Amboyna, however, according to one navigator, " cloves were in such abundance that the Dutch authorities at Batavia sometimes ordered a large number of clove trees to be extirpated and fixed the number of trees that should be in production. Thus, by a resolution of the year 1768, they ordered that the propagation of the clove trees should cease till their number was reduced to 550,000; the number of trees both young and fruit bearing was then 759,040 ".

" According to this navigator, at the time of his voyage to the East Indies there were 3,000,000 pounds of cloves in the Dutch warehouses at Batavia, of which not more than 200,000 could be disposed of annually in the Indies. In addition to the cloves stored in Batavia, there was enough stock of the spice in Holland to meet the needs of Europe for ten years. Such an abundance of cloves was a threat to the handsome market the Dutch strived to maintain and, consequently, large quantities of cloves were ' committed to the flames ' from time to time by the Dutch East India Company ".

" Similar conditions existed in nutmeg production and quantities of this spice were also periodically destroyed by fire to maintain the Dutch monopoly ".

In 1788 the British occupied the Malayan island of Penang, and about eight years later they successfully transplanted clove trees from the Moluccas into that island. By 1799 the ascendency of the British had progressed to such a degree that the Dutch East India Company was dissolved, and " the affairs of the Company were taken over by the Dutch government. The Dutch East India Company had been a progressive and powerful factor in the colonizing and trading affairs of the Netherlands for almost two hundred years; at the height of its prosperity, in 1669, the Company had one hundred and fifty trading ships, forty ships of war, one thousand sailors, and paid a dividend of forty per cent ".

In 1818 the clove tree was introduced from Mauritius into Zanzibar, and today Zanzibar, with the adjoining island of Pemba, produce by far the greater part of the world's supply of cloves. Later the nutmeg tree was successfully introduced into the West Indies. All these efforts over many years, together with territorial conquests by the British against the Dutch, completely destroyed the Dutch monopoly on spices in the East Indies.

" It is now four hundred and sixty years since Bartholomew Diaz doubled the Cape of Good Hope in the search for an all-water route to India, so that Portugal might wrest from the Moslem traders, the Sultan of Egypt, and the merchants of Venice the profitable spice

trade of the Orient. And we have seen how greatly this spice trade has shaped the course of history since that time. It is difficult for us, who buy our supplies of pepper, cassia, cinnamon, cloves, ginger, mace, and nutmeg so casually and so cheaply, to believe that there was ever a time when these spices were so eagerly sought after and represented so much wealth and power that destiny itself was indivisible from them ".

" The introduction of the highly valued spice plants of the East Indies into other countries and the maritime intercourse between east and west gradually changed the spice-production situation. Today, the East Indies, while still the largest pepper-producing center of the world, is no longer the great emporium for the fragrant spices it was in the days of the Dutch ascendency. Nutmegs and cloves are still exported from the Spice Islands, but a far larger export of nutmegs is carried on from the island of Grenada in the West Indies and Zanzibar is the leading source of supply for cloves. The export of cassia from Batavia is not nearly as great as the export of the highly esteemed Saigon cassia from Indo China ".

" Ginger was introduced into the West Indies by the Spaniards in the 16th century and today, Jamaica exports the finest ginger of all and by far the greater part of the world's requirements; other ginger is exported in small quantities from Africa and Japan. China exports cassia and preserved ginger. Ceylon is still the only important exporter of the delightfully fragrant *Cinnamomum zeylanicum;* that produced in the Seychelles and some other places is not a factor in world trade ".

" The Malabar coast ports export some of the world's best pepper and also a pungent ginger. Burma is not a spice exporting country; the long pepper originally found in the woods of Tenasserim is now cultivated in Bengal, India and also in Java. Siam is today at her lowest point as a producer and exporter of pepper; in the 17th century, her pepper was the cause of contention and conflict among foreign merchants, but today nobody fights about it. The different varieties of capsicum peppers native to Central America were early introduced into Africa, India, East Indies, Japan, and other countries. Today, these peppers are exported in all sizes and varieties from many parts of the world."

Utilization Abstracts

Peanuts. Considerable study has been devoted in recent years, particularly at the Southern Utilization Research Branch of the U. S. Department of Agriculture, to promoting greater utilization of peanuts. In a manner which defies abstracting here because of its very succinct though brief resume of this study, The Garden Journal of The New York Botanical Garden (Jan.–Feb., 1955) contains an excellent summary of this work.

Algae as Food. Perhaps no other potential aspect of plant utilization appeals so much to the imagination as does the possible supplementing of agricultural practice by large-scale cultivation of unicellular algae as a source of human food. Attention has been drawn to this in several past issues of ECONOMIC BOTANY. Two more contributions on the subject are contained in *The Scientific Monthly* (Jan., 1955).

The Aegean Garden

MARIA C. SHAW

To the memory of my parents

Abstract

In this paper I attempt to identify possible gardens, as opposed to natural landscapes, in Aegean artistic depictions. Scenes of nature occur in various media, but most extensively in frescoes. The Aegean garden remains elusive in art because of the artists' tendency to render plants and floral settings in idealized and fantastic ways. An exception is a possible formal garden depicted in the well-known floral fresco from the Minoan villa at Amnisos. Generally, however, the Aegean garden must have consisted of a natural landscape that was modified only in limited and subtle ways, through cultivation and other means. Important in the search for clues for such modifications are representations of cultivable types of flora, and activities in which people and animals interact with floral settings. It is suggested here that a Minoan garden may have existed in the east wing of the palace at Phaistos. This is a rocky outcrop with fissures and holes that may have been planted with flowers. As can be seen from a newly made topographical plan, the rock was trimmed with tools and incorporated in the architectural plan of that area of the palace.*

One of the most common themes of Aegean art is nature, particularly in Late Bronze Age I, roughly the mid-second millennium B.C. The efflorescence of a naturalistic style is most evident in the frescoes,[1] in which portrayals of the many faces of nature abound: flowering landscapes, fields, orchards, mountains, caves, marshes, and riverine and marine settings.[2]

The floral landscape, which forms the focus of this paper, is depicted sometimes solely in its vegetal or floral aspect, and sometimes as a sanctuary of wildlife—birds and animals. Occasionally people are pres-

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* This article is the outcome of a lecture I gave on the Minoan garden in the colloquium "Gardens of the Ancient Mediterranean," held at the University of Western Ontario on 13 October 1990. Despite the kind invitation by that university to publish my text in the proceedings in the *Journal of the History of Gardens,* I was unable to do so at the time. A revised version of the lecture was then given in the Seventh International Cretological Congress held in Rethymnon (25–31 August 1991). It is thanks to the encouragement I received on both occasions, and especially from Jörg Schäfer, who has been working and publishing recently on the same topic, that I am emboldened enough to publish on a subject related to botany, which I know rather little about. It should be understood that the emphasis here is on artistic visions of gardens and related settings and not on a scientific analysis of Aegean horticulture. Attention should be called to ongoing research by Ray Porter, which should result in an interesting and uniquely illustrated study on "The Natural History of Minoan Floral Depictions."

I would also like to thank a number of people who read my manuscript at various stages and made useful comments: Dawn Cain, Karen P. Foster, Barbara Ibronyi, Sara Immerwahr, Jeremy Rutter, Joseph W. Shaw, and Robin A. Shaw. I am nonetheless solely responsible for the opinions expressed here.

The following abbreviations are used:

Art and Religion	N. Marinatos, *Art and Religion in Thera: Reconstructing a Bronze Age Society* (Athens 1984).
Festòs II	L. Pernier and L. Banti, *Il palazzo minoico di Festòs* II (Rome 1951).
Immerwahr	S. Immerwahr, *Aegean Painting in the Bronze Age* (University Park, Pa. 1990).
Morgan	L. Morgan, *The Miniature Wall Paintings of Thera: A Study in Aegean Culture and Iconography* (Cambridge 1988).
Schäfer	J. Schäfer, "The Role of 'Gardens' in Minoan Civilisation," in V. Karageorghis ed., *Proceedings of an International Symposium: The Civilizations of the Aegean and Their Diffusion in Cyprus and the Eastern Mediterranean, 2000–600 B.C., Larnaca, 18–24 September 1989* (Larnaca 1992) 85–87.
TAW II	C. Doumas ed., *Thera and the Aegean World* II.1–2. *Papers Presented at the Second International Scientific Congress, Santorini, Greece, August 1978* (London 1978 and 1980).
TAW III	D.A. Hardy et al. eds., *Thera and the Aegean World* III.1–3. *Proceedings of the Third International Congress, Santorini, Greece, 3–9 September 1989* (London 1990).
Thera I–VII	S. Marinatos, *Excavations at Thera* I–VII (Athens 1968–1972, 1974, 1976).

[1] Publications on Aegean frescoes include Immerwahr; *Thera* I–VII; *Art and Religion*; Morgan; and C. Doumas, *The Wall-Paintings of Thera* (Athens 1992).

[2] For illustrations of such themes, roughly in the order in which they were mentioned, see Immerwahr pls. VII, 23, XIV, 30, 28, XIV, and 27. For a survey of this phase of Aegean wall painting, see Immerwahr ch. 4. See also W. Schiering, "Elements of Landscape in Minoan and Mycenaean Art," in R. Laffineur and J.L. Crowley eds., *EIKΩN. Aegean Bronze Age Iconography: Shaping a Methodology* (*Aegaeum* 8, Liège 1992) 317–22.

ent. These themes are rendered with varying degrees of detail, scope, and specification in a wide range of other artistic media besides frescoes: glyptic art (seals, signet rings, and carved stone vases), embossed and inlaid metalwork, and painted pottery.[3] The main geographical areas involved are Crete and Thera, whose cultures and art were closely interconnected at the time in question. Mycenaean art of the later Bronze Age (Late Helladic III) plays a lesser role in my considerations, largely because it copies from earlier art and because its themes are concerned more with people and their actions than with nature. The collective art of these areas is referred to generically as "Aegean"—a term with both geographical and chronological connotations.[4]

Given the popularity of floral landscapes during the early part of the Late Bronze Age, the question arises whether gardens were sometimes represented, and, if so, what criteria might we use for identifying them? Paradoxically, the answer is far from obvious, even when cultivable plants are present, for there are inherent inconsistencies and ambiguities in the information contained in the depictions. Indeed, the overwhelming theme in art seems to be nature in its wild, or untamed, state.

Scholars have concerned themselves with the Minoan attitude behind this apparent glorification of nature. Some 40 years ago, for instance, H. Groenewegen-Frankfort interpreted "scenes of nature" as channels for "mystic communion" expressing the joy of life in all its manifestations; the scenes, according to her, were set in timeless and unlocalized contexts.[5] Comparable perceptions of Aegean representations of nature are reflected today in epithets like the "religious" and "conceptual" landscape.[6]

Such views should not surprise us, for they recognize the human exultation and solace often found in nature, which can be seen as a mental and spiritual haven. Nature, however, can sometimes be judiciously modified by the human hand and still be perceived as "sacred." A modern parallel is provided in Chinese gardens that are considered sacred, even when the natural outdoor setting has been modified through horticulture and landscaping.[7] Is it possible that some of the idealistically rendered, and presumably "sacred," Aegean floral settings did not always allude to pure and untamed landscapes? A recent interpretation of a fresco from Amnisos, discussed below, suggests that there may have been Minoan sacred gardens.

Gardening as an art was already prevalent in the Bronze Age, most conspicuously in ancient Egypt,[8] but also in other areas of the Near East.[9] In Egypt there is clear evidence for specialized cultivation. Agricultural produce, orchards, decorative trees, bushes, and flowers are recorded in depictions from the Old Kingdom on. Normally cultivated in discrete areas in the earlier period, these kinds of flora were later combined in what have been recently classified as "luxury gardens," a type that became common in aristocratic domiciles in the New Kingdom.[10] The new emphasis on luxury in the private domain, in a civilization that had stressed for centuries the cult of the dead more than the transitory comforts of the living, could well reflect a desire by affluent Egyptians to emulate the way of life some had witnessed in other countries, especially since the New Kingdom had introduced an international era in Egypt. Such taste for the exotic is evident in the famous Expedition to Punt (probably Somaliland), undertaken during Queen

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[3] References to seals will be mostly to *CMS*. For stone vases the main study is P. Warren, *Minoan Stone Vases* (Cambridge 1969). For embossed and inlaid metalwork see bibliography for chs. 7 and 8 in S. Hood, *The Arts of Prehistoric Greece* (Harmondsworth 1978) 286–87. For vase painting see P. Betancourt, *The History of Minoan Pottery* (Princeton 1985); and G. Walberg, "Minoan Floral Iconography," in Laffineur and Crowley (supra n. 2) 241–46.

[4] For a definition of the term "Aegean," especially as applied to wall painting, see Immerwahr 1–5. Special studies have shown that, though very similar, Minoan and Cycladic art each has its own idiosyncrasies. See E.N. Davis, "The Cycladic Style of the Thera Frescoes," in *TAW* III.1, 214–27; and L. Morgan, "Island Iconography: Thera, Kea, Milos," in *TAW* III.1, 252–66.

[5] H.A. Groenewegen-Frankfort, *Arrest and Movement* (London 1951) ch. 5.

[6] For references to such views, see Schäfer passim. For a recent discussion of nature in Aegean art, see *Art and Religion*, ch. 7.

[7] M. Keswick, *The Chinese Garden* (New York 1978) passim.

[8] A short but informative account of the Egyptian garden is given in a publication of the Museum of Fine Arts, Boston, *Egypt's Golden Age* (Boston 1982) 37–39. The garden and its association with buildings is extensively discussed in A. Badawy, *A History of Egyptian Architecture: The First Intermediate Period, the Middle Kingdom, and the Second Intermediate Period* (Berkeley 1966); and Badawy, *A History of Egyptian Architecture: The Empire* (Berkeley 1968). Two recent studies are J.-C. Hugonot, *Le jardin dans l'Égypte ancienne* (Frankfurt 1989); and Hugonot, "Ägyptische Gärten," in M. Carroll-Spillecke ed., *Der Garten von der Antike bis zum Mittelalter* (Mainz 1992) 9–44. In the earlier publication, Hugonot describes the following types of gardens: "jardin de rendement," "jardin de luxe" or "jardin d'agrément," and "jardin cultuel" (pp. 268–74).

[9] See J.C. Margueron, "Die Gärten in Vorderen Orient," and V. Karageorghis and M. Carroll-Spillecke, "Die heiligen Haine und Gärten Zyperns," in Carroll-Spillecke (supra n. 8), respectively, 45–80 and 141–52.

[10] Hugonot 1989 (supra n. 8) 268.

Hatshepsut's reign and recorded in inscriptions and reliefs in her temple at Deir El Bahri. The purpose of the expedition was to import plants, trees, and even animals, in addition to other precious materials. A botanical garden that the queen dedicated to the god Amon was thus created at Deir El Bahri.[11]

Thus, the functions of the Egyptian garden included producing food to sustain life and afterlife, as well as providing a place for leisure and relaxation and for the conduct of ritual and worship. That Egypt was also in contact with the Aegean during this period is reflected in the paintings of the *Keftiu* people, generally believed to be from the Aegean. Interestingly, the first such paintings appeared in the tomb of Senmut, the architect of Amon's temple during Hatshepsut's reign.[12] Although the nature of these contacts is difficult to ascertain, Egypt and the Aegean were not living in "splendid" isolation.

The state of our knowledge of and the evidence for Aegean horticulture needs only be summarized, as aspects of it have already been dealt with in greater detail by botanical experts. Some of this evidence is tangible or scientifically ascertained, and some inferred from ancient illustrations. The former is disappointingly limited, the latter often ambiguous. Another difficulty is that, in contrast to the dry climate of Egypt, that of Greece does not allow for the preservation of normally perishable vegetal remains. Such information is equally lacking for Greece in the later periods.[13]

The discovery in excavations of flowerpots—clay and faience vessels with an aperture at the base—clearly indicates some cultivation of flowers or other plants in the Aegean, and there are also representations in art of vases containing flowers, but these may have been receptacles for cut flowers.[14] Artistic depictions of domesticated and wild varieties of flora have also been identified by archaeologists and botanists.[15] Linear B tablets mention a number of agricultural products (wheat, barley, millet, peas, beans, olives, figs, grapes, almonds) and spices, condiments, and herbs (coriander, cumin, fennel, sesame, mint). Evidence for some of these products has occasionally been found in excavations in the Aegean. Little is said about flowers in the tablets, but poppies, safflowers, and roses are mentioned, the roses indirectly and in connection with the making of perfume. There is also possible mention of saffron.[16] Evans, on his part, saw connections between certain flowers and plants and certain Minoan hieroglyphic and pictographic signs, such as one apparently depicting saffron crocuses.[17] Pollen deposits are unfortunately rare and inconclusive and do not inform us about flowers and gardens. Examination of carbonized vegetal remains, though a part of excavation analysis more and more, is still a relatively recent practice.

The search for information on Aegean horticulture is also complicated by certain peculiarities of representation among Aegean artists. While Egyptian depiction is relatively pragmatic and, when used judi-

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[11] See Badawy 1968 (supra n. 8) 488–89, for references to the reliefs and to the garden of Amon.

[12] See J. Vercoutter, *L'Égypte et le monde égéen préhellénique* (Cairo 1956); and S. Wachsmann, *Aegeans in the Theban Tombs* (*Orientalia Lovaniensia Analecta* 20, Louvain 1987).

[13] M. Carroll-Spillecke, *Kepos: Der antike griechische Garten* (*Wohnen in der klassischen Polis* 3, Munich 1989).

[14] The evidence for both types of vessels has been reviewed recently by M. Platon, "Γλάστρες καὶ ἀνθοδοχεῖα στὸ Μινωϊκὸ κόσμο," in *Εἰλαπίνη: Τόμος τιμητικὸς γιὰ τὸν καθηγητὴ Νικόλαο Πλάτωνα* A (Herakleion 1987) 227–34, passim. What look like flower vases, rather than flowerpots, can be seen in the painting in the West House at Akrotiri, Thera, where each jamb of a window is painted with such a vase filled with lilies (*Thera* VI [pl. vol.], pl. 3).

[15] M. Möbius, "Planzenbilden der minoischen Kunst in botanischer Betrachtung," *JdI* 48 (1933) 1–39 is one of the best earlier studies. Recent publications, mostly on specific aspects of Aegean flora, include S. Amigues, "Le crocus et le safran sur une fresque de Théra," *RA* 2 (1988) 227–42; C. Diapoulis, "Prehistoric Plants of the Aegean Sea," in *TAW* II.2, 129–40; I. Douskos, "The Crocuses of Santorini," in *TAW* II.2, 142–46; O. Höckmann, "Theran Floral Style in Relation to That of Crete," in *TAW* II.1, 605–16; Morgan, esp. 17–41; O. Rackham, "The Flora and Vegetation of Thera and Crete before and after the Great Eruption," in *TAW* II.1, 755–64; Rackham, "Observations on the Historical Ecology of Santorini," in *TAW* III.2, 384–91; P. Warren, "Did Papyrus Grow in the Aegean?" *AAA* 9 (1976) 89–95; Warren, "The Miniature Fresco from the West House at Akrotiri, Thera, and Its Aegean Setting," *JHS* 94 (1979) 115–29; and Warren, "The Fresco of the Garlands from Knossos," in P. Darcque and J.-C. Poursat eds., *L'iconographie minoènne: Actes de la Table ronde d'Athènes (21–22 avril 1983)* (*BCH* Suppl. 11, 1985) 187–208. A very recent study is Walberg (supra n. 3).

For comparisons with modern flora see W. Greuter, "Floristic Report on the Cretan Area," *Mémorias da Sociedade Broteriana* 24 (1974) 131–71; A.J. Huxley, *Flowers of Greece* (London 1972); Huxley and W. Taylor, *Flowers of Greece and the Aegean* (London 1977); A.D. Niebuhr, *Herbs of Greece* (Athens 1970). H. Bowman, *Ἡ Ἑλληνικὴ Χλωρίδα* (Athens 1984), first published as *Die griechische Pflanzenwelt* (Munich 1982), deals with modern flora and its reflections in ancient art and literature.

[16] For discussions of the subject in the Linear B tablets, see M. Ventris and J. Chadwick, *Documents in Mycenaean Greek* (Cambridge 1956) 129–31, 213–31. An interesting study is also C. Murray and P. Warren, "PO-NI-KI-JO among the Dye-plants of Minoan Crete," *Kadmos* 15 (1975) 40–60. Roses and the perfume industry are discussed on the basis of tablets and archaeological paraphernalia at the palace of Pylos in C. Shelmerdine, *The Perfume Industry of Mycenaean Pylos* (*SIMA-PB* 34, Göteborg 1985).

[17] *PM* I, 281–85.

ciously, a good source for botanical information,[18] Aegean representations tend to be impressionistic and to stress aesthetic qualities, often at the expense of accuracy. Aegean representational art also combines the real with the unreal, both in a broad sense, as, for instance, the realms of the human and the divine,[19] and in iconographic detail. One of the most common instances of the latter practice is botanical hybridization, that is, the combination of elements of different flowers or of different species of the same flower in a newly created composite type.[20] Equally confusing is the apparently contradictory situation in which only one type of flower is shown growing, as if through selective cultivation, in a wild landscape (see fig. 22, below). Perhaps the one safe conclusion that can be drawn is that this ambiguity reflects the character and extent of Aegean "gardening," which involved only a limited and discrete human tampering with the natural landscape. Finally, Minoan depictions, as discussed earlier, are not intended to convey concrete details but rather the spirit of nature, whether wild or tame.

FLORAL SETTINGS IN GLYPTIC ART

Glyptic art and frescoes constitute the major areas of artistic representation of flora. Carved stone vases are limited in number, but they depict floral settings, some of which are incorporated in discussions below. Much more extensive is the iconographic information found in carvings in seals and signet rings, the rings often being late in date and usually found in Mycenaean contexts. There are, however, inherent limitations in such depictions. The small field available for representations results in less detail and more emphasis on symbolic rendition, when compared to frescoes. What is very clear, nevertheless, is the role played by nature and by flowers. Among the most expansive scenes, human figures, mostly women, are involved in activities that take place in the open. The scenes show the offering of flowers to a goddess, a gathering of divinities and adorants in a field of lilies, the placing of flowers on altars, and orgiastic behavior on the part of men and women interacting with plants, trees, shrines, and other elements in outdoor settings. Although one is aware of the all-pervasive force of nature and the role played in ritual by plants and flowers, there is little information about cultivation.[21]

More interesting, for our purposes, are specific motifs in glyptic depictions. Trees and plants often rise from the top or from within structures, some possibly built in stone and acting as small shrines, and others perhaps made of timber, to judge from what look like sticks, slats, or posts. While some of these structures may have been fixed and permanent, some may have been movable and used for transporting trees and plants.[22] The structure depicted in a carved scene on a signet ring from Mochlos seems to be such a device.[23] It contains a small tree, or a large plant, and it is being transported in a boat in which a woman sits. Perhaps the purpose of the voyage is to transplant the tree, or seedling, unless it is already planted in the small structure.

Horns of consecration are often shown on top of stands or altars with plants and flowers rising from them. It cannot be determined whether they were equipped with sockets to hold the flora, or if they served as vases or planters.[24] Interesting also is a very common seal design in which either a kantharos or a ewer is set in the midst of floral sprays and other vegetation. Although the allusion here is probably to divine providence and its gift of water, rather than to

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[18] For discussions of ancient Egyptian flora, see R. Germer, *Flora des pharaonische Ägypten* (Mainz 1985); Hugonot 1989 and 1992 (supra n. 8); L. Keimer, *Die Gartenpflanzen im alten Ägypten* 1–2 (Hildesheim 1967, Mainz 1984); L. Manniche, *An Ancient Egyptian Herbal* (Austin 1989); and M.F. Moens, "The Ancient Egyptian Garden in the New Kingdom: A Study of Representations," *Orientalia Lovaniensia Periodica* 15 (1984) 11–53.

[19] An example is the wall painting from Xeste 3 at Thera (infra fig. 15), which shows a goddess accompanied by a griffin in the same scene as a woman saffron gatherer, the only mark of separation being a monkey who seems to act as an intermediary between divinity and mortals.

[20] See I. Cerceau, "Les représentations végétales dans l'art égéen: Problèmes d'identification," in Darcque and Poursat eds. (supra n. 15) 181–84.

[21] For some interesting scenes, see *CMS* I, nos. 17, 127, and 279; *CMS* II, pt. 3, nos. 7 and 51. For a study of botanical import based on seals, see P. Warren, "Of Squills," in *Aux origines de l'hellénisme: La Crète et la Grèce* (Paris 1984) 17–24.

[22] These little structures were first brought to my attention by J. Younger (personal communication, 1990). Examples abound in depictions in seals. The structure of the first type is illustrated in *CMS* I, no. 126, and the second type in *CMS* IX, no. 115. In *CMS* I, no. 123, an unusual device at the base of a tree can be seen. It is marked by two crossed diagonal lines at the center flanked by what look like loops or handles. Perhaps the motif represents a carrier for transporting the tree, or rather a seedling.

[23] The Mochlos seal is illustrated in *CMS* II, pt. 3, no. 252.

[24] For some examples, see *CMS* I, nos. 231 and 279; and *CMS* II, pt. 3, no. 7.

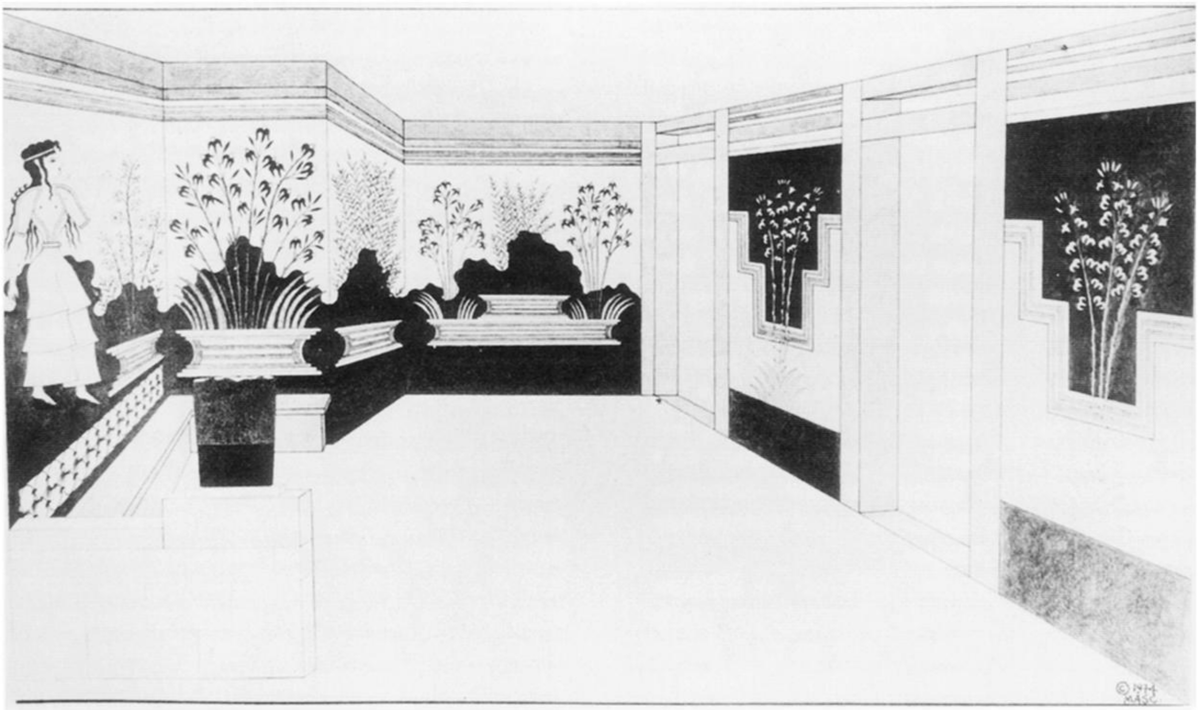

Fig. 1. Restored fresco from the Minoan villa at Amnisos. (M.A.S. Cameron in *TAW* II.1, 581, pl. 1)

a human horticultural activity, we can also consider the possibility that these vases were actually used for watering.[25]

FLORAL SETTINGS IN FRESCOES

Much more revealing for our quest are the frescoes, because of their relatively large scale and because they employ color. Both aspects enhance definition. Important in the frescoes is also the role played by human figures, one that is not always merely symbolic, but also quasi-narrative and descriptive. Such figures, who are mostly women, are often shown interacting with natural floral settings. Although themes of this type are encountered in seals, in frescoes a wider range of activities is represented. One of the problems in matching themes in the two media may be the fact that excavations at Akrotiri, Thera, have recently yielded massive information on frescoes but hardly any seals. One theme that is repeated in both media is the offering of cut flowers, lilies and other types.[26] In a fresco from room 3b in Xeste 3 at Thera, some of the women in a procession are carrying bouquets of flowers to an unknown destination.[27] The conventionalized offspring of this theme appears later in processions of women holding flowers in Mycenaean palatial frescoes.[28]

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[25] For examples of such vessels, see *CMS* II, pt. 3, nos. 242, 260, and 261. Such a vessel was typically seen held by the Minoan Genius (see *CMS* II, pt. 5, no. 322). The idea that at least the ewer in seal depictions may have alluded to rain as nourishment for vegetation is discussed in J. Weingarten, *The Transformation of Egyptian Taweret into the Minoan Genius: A Study in Cultural Transmission in the Middle Bronze Age* (*SIMA* 88, Partille 1991) 12, n. 51.

[26] For the offering of lilies to a goddess, see *CMS* I, nos. 17 and 279.

[27] Doumas (supra n. 1) pl. 133. Here, only one woman can be said with certainty to be carrying flowers. She is wearing a diaphanous blouse decorated with lily blossoms, with a heavier garment on top, pinned over her right shoulder. Red rosettes appear over this garment and could be part of its embroidered or woven decoration. On the other hand, in the non-joining plaster fragment (bottom right in the illustration), the rosettes spread beyond the garment, which is painted in ocher, over a white area that seems to be the woman's bare bosom. There is another woman from the same composition who definitely carries a bouquet of lilies, and who is not included in the above publication. She can be seen in a black-and-white photo in *AR* 1980, 5, fig. 2.

[28] For Xeste 3 see *Thera* VII, pls. 65–66 and a reconstruction of the scene in *Art and Religion*, fig. 44. For Mycenaean women carrying flowers, see E. Vermeule, *Greece in the Bronze Age* (Chicago 1964) pl. XXVII.

In the frescoes, certain settings are clearly natural landscapes. Such is the topography in the painted miniature friezes from the West House at Thera, with their panoramic views of towns with mountains, rivers, marshes, and bays, and in the "Tropical Landscape," though it has been suggested for the last that it depicts a cultivated area, a kind of "landscape garden."[29] Turning to "gardens," and keeping in mind the assumption expressed above that there may have been little tampering with the natural landscape in order to produce a garden, it becomes clear that one needs more than the presence of cultivable plants to identify a garden. Evidence for a frequent and intimate human use and modification of particular outdoor locations also needs to be examined. Such evidence could well be found in the close association of floral settings with architecture and architectonic structures, real or portrayed.

A fresco from Amnisos, northeast of Knossos, seems to belie the idea that the Aegean people, in this case specifically the Minoans, did not have formal gardens (fig. 1). The mural was found in 1932 in an opulent house built during the Middle Minoan III–Late Minoan IA period. As usual with Aegean frescoes, except for those at Thera, the mural was preserved only in fragments collapsed from the walls. Two panels were restored and placed on display in the Archaeological Museum of Herakleion.[30] In one, a clump of lilies with symmetrically arranged stems rises within a stepped or "battlement" pattern (fig. 1, right, where it appears twice). The other panel in the museum depicts a variety of plants and flowers rising from broad, low structures with incurved sides against a background of stylized rockwork painted red, below a white area representing the sky (fig. 1, center).

Cameron's restoration of this fresco, which incorporated unpublished fragments stored in the museum in addition to the panels displayed, has recently come under criticism; it has been pointed out, for instance, that there is no evidence for the woman he restores (fig. 1, left).[31] The mural decoration is also likely to have been less extensive, if, as has been proposed recently, the painting had decorated a loggia rather than a regular room with four walls.[32] I might also add that we cannot be certain that the lily compositions formed separate panels, as restored both in the museum and by Cameron. The battlement motif, whatever its meaning, may have instead continued behind clumps of lilies for the entire width of the wall. If so, the Amnisos landscape would have looked more like the scenery that spreads uninterruptedly across several walls in the well-preserved Spring Fresco from Thera (see below, fig. 22) or in the painting from the House of the Frescoes at Knossos, as restored (fig. 4, below). None of these comments, however, detracts from the fact that the scheme and the iconographic details of this unusual fresco convey the impression of an organized setting, by all appearances a formal garden.

The iconography and meaning of the Amnisos fresco have been the subject of a recent and incisive study by J. Schäfer, which concentrates on what he

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[29] This was proposed by Morgan because of the cultivable types of palm trees that appear in the landscape (Morgan 39–40, figs. 4–7). I tend to agree with other scholars who objected that the cultivable species were illustrated simply because they were more familiar to the artists. The exclusion of human figures from the "Tropical Landscape," in contrast to the other friezes in the same room, suggests that the scene emphasizes the idea of an exotic landscape and a natural habitat of wildlife (M. Shaw, "Painted 'Ikria' at Mycenae?" *AJA* 84 [1980] 179). Recently, however, it has been suggested that this part of the frieze also contained a town, like the friezes on the north and south walls. The theory relies on the discovery of a new plaster fragment and its attribution to the "Tropical Landscape." Only a preliminary study has so far been published: C. Televantou, "New Light on the West House Wall-Paintings," in *TAW* III.1, 309–24, esp. 322.

[30] A color illustration of the panel with the lilies can be seen in S. Marinatos, *Crete and Mycenae* (New York 1960) pl. XXII. For the other panel, see *PM* IV, pt. 2, suppl. pl. LXVIIa.

[31] M.A.S. Cameron, "Theoretical Interrelations among Theran, Cretan and Mainland Frescoes," in *TAW* II.1, 578–92, pl. 2B–C. For the fact that there was no evidence for a woman, see Schäfer 86.

[32] The loggia was directly above a lower portico on the ground floor, space 7a, where the plaster fragments were found fallen. See V. Stürmer, "Bemerkungen zur Rekonstruktion der Lilienvilla von Amnisos," in *Proceedings of the Sixth International Cretological Congress* A2 (Chania 1990) 299–304, esp. 302, figs. 1–3. The restoration of a loggia finds support in the discovery of a column base in the debris over the floor of the lower portico, as noted by S. Marinatos in "Funde und Forschungen auf Kreta," *AA* 1933, 290. Because of the distribution of the fallen plaster fragments, Marinatos realized that only three of the four sides of the room had been painted, but he thought that it was the eastern wall that was unpainted. I propose that it is the western side that did not have extensive murals, for even if this had been a closed room, rather than a loggia, that wall would have been the logical side to have windows. If the space upstairs were a loggia, the painting would have been limited to the long eastern wall, possibly with panels on the shorter walls at the north and south sides of the room, where doors need to be restored. Cameron's architectural setting for the frescoes should be reexamined in terms of such considerations.

See also Stürmer's most recent discussion of the painted room in the Amnisos villa in J. Schäfer, *Amnisos* (Berlin 1992) 129–50. This publication came out too late to be commented on here.

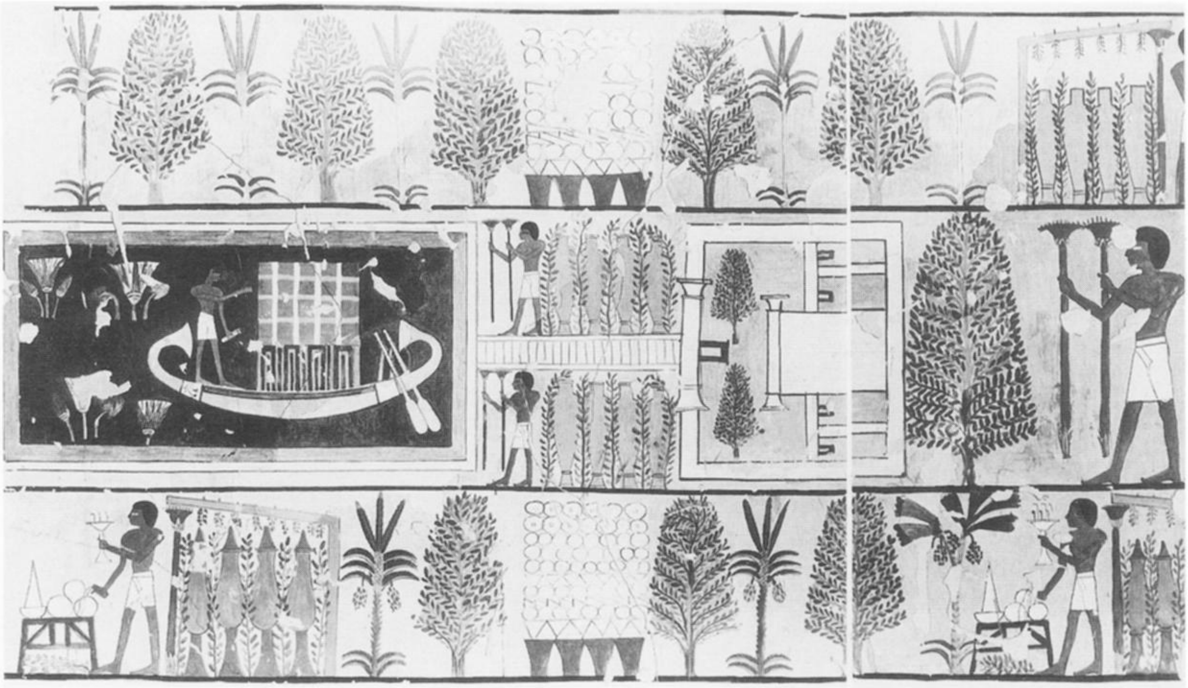

Fig. 2. Painting of a garden, from the tomb of Minnakhte. (C.K. Wilkinson and M. Hill, *Egyptian Wall Paintings* [New York 1983] 12, fig. 6)

sees as two Egyptianizing features.[33] One is the so-called battlement pattern seen in the panels with the lilies (fig. 1, right). Schäfer interprets the pattern as a reflection of the borders of pools of water often depicted in Egyptian wall paintings and usually rendered in cavalier perspective. Such pools were typical in "luxury gardens" in Egypt, and their plan was either rectangular or T-shaped, the latter described by Schäfer as a "channel-pool."[34] Figures 2 and 3 here illustrate a garden of the plain, rectangular variety, as

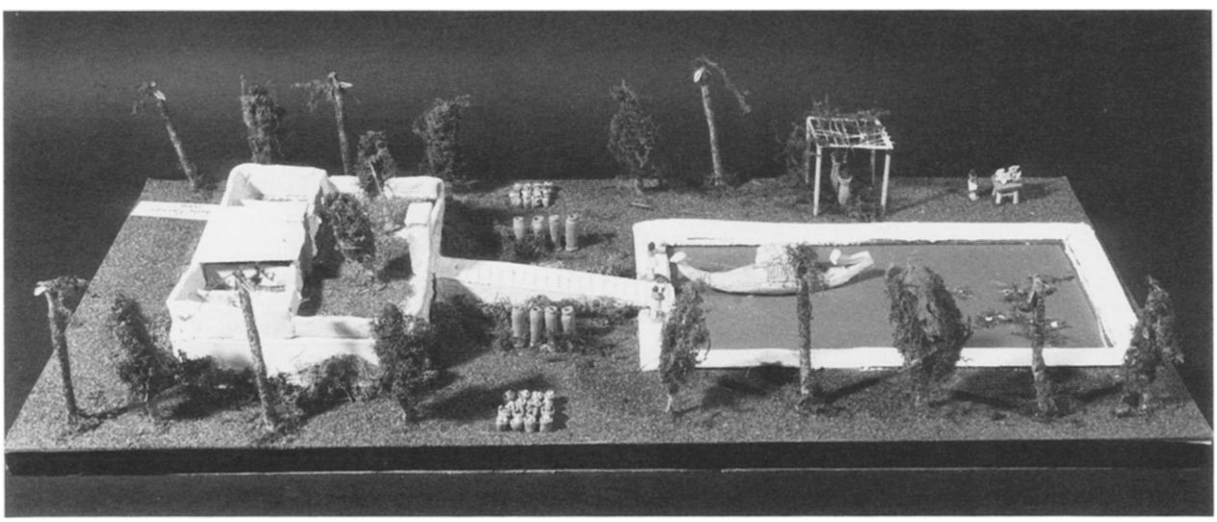

Fig. 3. Model of the painting shown in figure 2. (K. Parker)

[33] Schäfer passim. A new study of aspects of the Aegean garden has just been published by the same author—too late for his views to have been taken into account in my article. See J. Schäfer, "Gärten in der bronzezeitlichen ägäischen Kultur? Rituelle Bildsprache und bildliches Konzept Realität," in Carroll-Spillecke (supra n. 8) 101–40, esp. 112–26 and 133 for references to the Amnisos fresco.

[34] Schäfer 86.

seen in a painting from the 18th-Dynasty Theban tomb of the official Minnakhte and in a model version that conveys a more concrete impression of the setting.[35]

The second Egyptianizing feature that Schäfer examines in the Amnisos fresco is the form of the flower "receptacles" with incurved sides, which he connects, as S. Marinatos had done earlier, with the Egyptian hieroglyphic sign *mr*. The motif, Schäfer notes, also appears in the inlaid decoration of a cup from a shaft grave at Mycenae.[36] The *mr* sign, as made clear in Schäfer's study, was already known in Egypt during the Old Kingdom and was associated with the ideas of "lake" or "pool" or "channel filled with water." An iconic version of the sign also appears in Egyptian art, where it is used as a socket for plants with clear religious associations.[37] In noting these apparent affinities with Egypt in the Amnisos fresco, Schäfer comes to the conclusion that the Amnisos scene represents an actual sacred Minoan garden incorporating Egyptian traits, including *meru* receptacles for flowers.[38]

Such intriguing thoughts on interconnections, though difficult to prove with tangible evidence, now gain credibility in the light of recent discoveries at Tell El Dabʿa, ancient Avaris, in Egypt. The recently found frescoes from this site, the capital of the Hyksos, leave no doubt that Aegean fresco artists worked in Egypt, apparently during Hyksos rule, and that they were commissioned to decorate the palace. Actual Hyksos gardens have been excavated at this site.[39]

The uniqueness of the Amnisos fresco in providing evidence for Minoan gardens becomes more obvious when we turn to other wall paintings. Our next example, from the House of the Frescoes at Knossos, shows a scene of birds and monkeys in a rocky landscape, illustrated here in Cameron's restoration (fig. 4).[40] The flowers, some in hybrid guise, are of many types: crocuses, papyri, ivies, madonna and pancratium lilies, and roses.[41] The impression is of a wild landscape, and yet the monkeys, which were imported to Crete, were pets that would have been placed where they could be seen or used by their owners, rather than simply abandoned in the countryside.

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[35] The model was made in 1988 by Kimberly Parker, an undergraduate student at Scarborough College, University of Toronto, for my course on Egyptian and Aegean wall painting. It is a comment on the pictorial clarity of Egyptian representation that, once basic artistic conventions have been grasped, the images can be visualized.

[36] Schäfer 86–87. There, as at Amnisos, however, it is not clear whether the structures were hollow, and therefore "receptacles," or flat, and therefore "platforms." The same ambiguity exists in the case of what look like small tables with plants placed on them within the religious symbol of double horns encountered in seals (*CMS* I, no. 231; *CMS* II, pt. 3, no. 7).

[37] Schäfer 87.

[38] The *meru* receptacles bear a close resemblance to Aegean altars with incurved sides, also described as "waisted" altars. Though there may be some shared religious symbolism between the two objects, the difference is that any plant receptacles of that shape would have obviously been hollow and perhaps made of perishable or breakable materials (wood or terracotta), while the "altars" were solid, flat on the top and, to judge from examples actually found, were made of stone. For a discussion of such "altars," see M.C. Shaw, "The Lion Gate Relief of Mycenae Reconsidered," in *Φίλια ἔπη εἰς Γεώργιον Ε. Μυλωνὰν διὰ τὰ 60 ἔτη τοῦ ἀνασκαφικοῦ του ἔργου* (Athens 1986) 108–23, passim.

In addition to reflecting an Egyptianizing garden, the Amnisos fresco may also tie in with a Minoan pictorial tradition. A partial parallel in Crete may be a painting from the lustral basin in the north wing of the palace at Zakros. Only the lower part of the painting is preserved and has been recently copied and restored (M. Platon, "Νέες ἐνδείξεις γιὰ τὸ πρόβλημα τῶν καθαρτηρίων δεξαμενῶν καὶ τῶν λουτρῶν στὸ Μινωϊκὸ κόσμο," in *Proceedings* [supra n. 32] 141–55, pl. 27b). Large leaves, as if of a tall plant, rise from an architectonic base, part of which is referred to by M. Platon as an altar. Having seen the actual fresco at Zakros and the Amnisos painting in the museum, my impression is that the Zakros arrangement best resembles that of the lower part of the Amnisos panel with irises and other plants (fig. 1, center and left). In both cases the plants rise against red rock formations from what look like superposed structures marked by painted horizontal stripes. A larger published reproduction of the watercolor copy of the Zakros painting is necessary, however, to make closer comparisons possible.

[39] M. Bietak, "Minoan Wall Paintings Unearthed at Ancient Avaris," *Egyptian Archaeology* 2 (1992) 26–28. It is an interesting coincidence that the plaster dumps were found in an open area used as a garden during the period of the Hyksos palace. Here at least is one place where Aegean artists could have familiarized themselves with an Egyptian garden. Not only the technique (which appears to be true fresco) but also the themes of these wall paintings point to Aegean artists. Bull-leaping in particular points to the palace at Knossos as the likely origin of some of the Avaris painters. This and other matters were discussed recently in a symposium entitled "Egypt and the Minoan World: Recent Finds in the Nile Delta," held at the Art Institute of Chicago (12–13 February 1993). Two talks that supported close Knossian connections were M. Bietak, "Egypt and the Minoan World in the Light of Recent Finds at Tell El Dabʿa, Eastern Nile Delta," and M.C. Shaw, "Tumblers, Acrobats and Bull-Leapers in Aegean and Egyptian Wall Painting."

[40] M.A.S. Cameron, "Unpublished Paintings from the 'House of the Frescoes' at Knossos," *BSA* 63 (1968) 1–31, fig. 13 with restoration.

[41] *PM* II, 431–67.

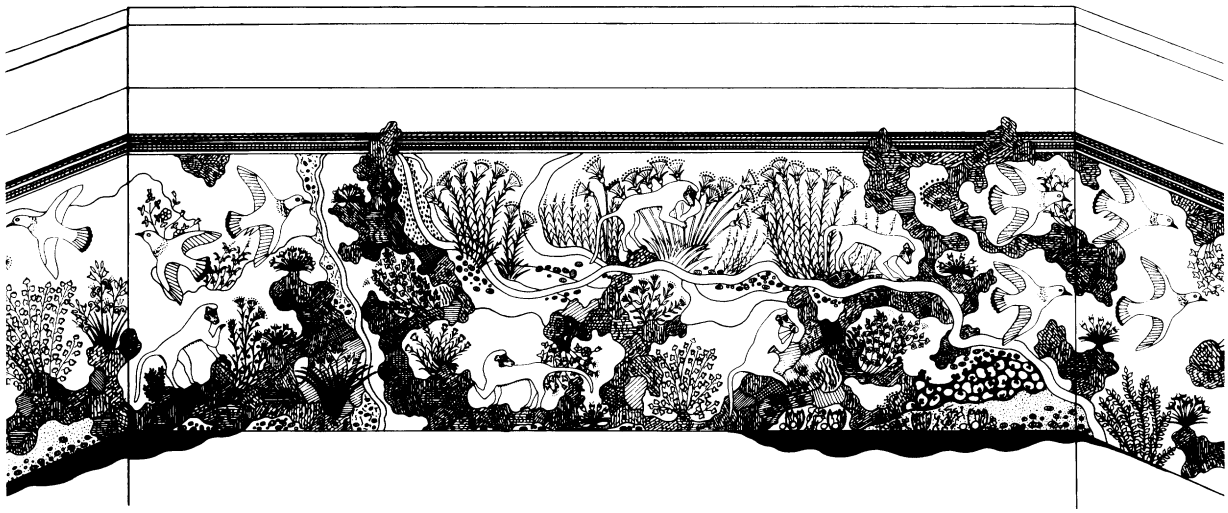

Fig. 4. Restored fresco from the House of the Frescoes at Knossos. (Detail from M.A.S. Cameron, *BSA* 63 [1968] 24, fig. 13)

Here the matter of the geographical location of the landscape needs to be raised. Does the scene in the fresco represent 1) a Minoan vision of the natural habitat from which these pets were originally obtained, 2) a Minoan landscape where the monkeys were left to roam freely, or 3) a nature sanctuary that the Minoans dedicated to a nature divinity, having populated it with imported exotic animals? In the case of the third alternative, the setting would have functioned somewhat like a modern zoo, in the sense that it would have been both used and visited by at least the owners of the animals. Such a use, naturally, would not qualify the setting as a garden.[42]

Similar questions can be raised in the case of a composition from Thera showing monkeys madly clambering among impressionistically rendered rocks near a river in a minimalist landscape devoid of vegetation.[43] Interestingly, that scene has been linked by N. Marinatos to one she restores on an adjacent wall, on the basis of associated plaster fragments found in the same room (B4). Marinatos's interpretation is that the monkeys, religious animals par excellence in the Aegean, are seen in the "environment of the divinity: the spring landscape."[44] If the two scenes go together, as appears to be the case, then there is a deliberate and meaningful antithesis in theme and mood between them. The wild monkeys and barren setting contrast dramatically with the peaceful calves or goats and the swallow gliding over a rocky landscape, but one graced with vegetation: reeds by the river, clumps of crocus flowers, and floral sprays. The contrast may well be one between a wild and a tamed landscape, complemented by appropriate animal behavior. An analogous dichotomy in the character of a seemingly continuous topographical setting is seen again in a fresco from the villa at Haghia Triadha (fig. 10), discussed below.

Figure 5 shows a detail of the painting of the Crocus Gatherer from the palace at Knossos. Further cleaning, after Evans's excavations of the space where the fresco was originally found, yielded more stucco fragments that show the painting to have been part of a frieze, rather than a panel. It too depicts monkeys who now pluck crocus flowers in a rocky landscape, rendered in typical Minoan perspective with rockwork hanging from the top to denote that it extended into the background (detail in fig. 5).[45] One crucial difference, however, distinguishes this fresco from those

[42] Here I disagree with N. Platon who interpreted the setting as a royal garden (N. Platon, "῾Ο κροκοσυλλέκτης πίθηκος: Συμβολὴ εἰς τὴν σπουδὴν τῆς Μινωϊκῆς τοιχογραφίας," *CretChron* 1 [1947] 505–24, esp. 515). One of the details that gave Platon this impression is the so-called "jet d'eau" in the fresco, which, however, as first Evans and then Cameron suggested on valid pictorial grounds, represents a natural waterfall and not a man-made fountain. See Cameron (supra n. 40) 11, fig. 4c.

The question of the type of monkeys portrayed in Aegean art and the geographical areas that form their natural habitat is reviewed in E.H. Cline, "Monkey Business in the Bronze Age Aegean," *BSA* 86 (1991) 29–42, esp. 31, 40.

[43] *Thera* V, pl. D.

[44] *Art and Religion* 115–16, fig. 83, foldout D. Some doubt has recently been cast by Doumas (supra n. 1) 111 on Marinatos's belief that the two landscapes belonged to two adjoining walls.

[45] For the complete frieze as restored with more monkeys, see Platon (supra n. 42) col. pl. 29.

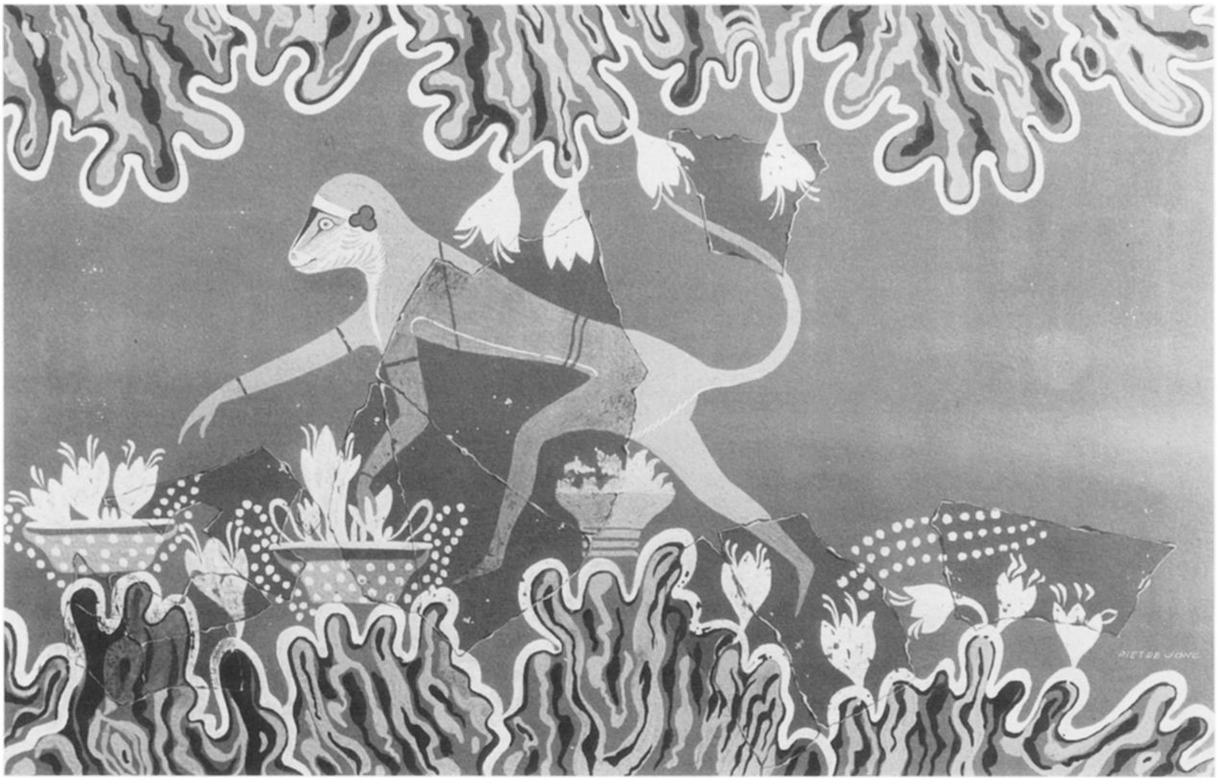

Fig. 5. Detail of the Saffron Gatherer Fresco from the palace at Knossos, as restored by P. de Jong. (Courtesy Royal Ontario Museum, 938.66.3)

already discussed: the best-preserved monkey is seen wearing a harness. The obvious implication is that this animal and probably the rest of the monkeys, which are poorly preserved, were pets. They were led there leashed by the people who owned them and could be taken, again leashed, to other places on certain occasions.

Can the place where the monkeys were kept be thought of as a garden, a place frequented regularly by people? Only crocus flowers grow in this landscape, and they are shown emerging not only from the rocky ground but also from vessels. It has often been assumed in the past that these vessels were flowerpots, and that the crocus flowers were being mischievously plucked from them by the monkeys.[46] A more convincing explanation is that the vessels were placed there to serve as receptacles for cut crocus flowers, or more likely just the blossoms, and they might even be baskets, broad and low, like the *paneri* used for collecting agricultural produce in Greece today. An excellent parallel for the shape of the container can be seen on a fragment of a carved stone rhyton from Knossos depicting a man, very much in the posture of the monkey in the fresco, placing a two-handled receptacle with hatched markings, most likely a basket, in front of a shrine.[47] A basket can be seen in the Theran fresco illustrated below in figure 15, also connected with the harvesting of crocus flowers.[48] The beads strung in loops and lines and attached to the vessels or baskets in the Knossian fresco may well have been decorative handles or some device for lifting and transporting the receptacles once they had been

[46] Platon (supra n. 42) 522.

[47] See Warren (supra n. 3) 85, pl. P476, where the receptacle seen in the carved scene on the stone vase is described as a basin. The hatching on it, however, suggests to me basketry weaving. Interestingly, the nickname "kalathos" has been assigned by ceramicists to a shape not unlike that of the vessels in the Crocus Gatherer fresco: P. Betancourt (supra n. 3) fig. 93. For evidence for baskets in the Aegean, see *Thera* III, 14 and pl. 12, top; J.-C. Poursat, "Vannerie," *EtCret* 26 (1980) 91–98; and P. Betancourt, L. Berkowitz, and R.L. Zaskow, "Evidence for Minoan Basket from Kommos, Crete," *Cretan Studies* 2 (1990) 73–77.

[48] See now the excellent illustration in Doumas (supra n. 1) pl. 122, in which one can see at the lower left a basket resting on the bench.

Fig. 6. Dwarf walking leashed monkey and dogs, from an Old Kingdom relief in Egypt. (After K. Klebs, *Die Reliefs des alten Reiches (2980–2475 v. Chr.)* [Heidelberg 1915] 34, fig. 21)

filled. The monkeys are clearly mimicking a human activity they had witnessed: the cutting and gathering of flowers.[49]

This association of crocus picking, crocus gatherers, and monkeys is implicit in other Aegean representations. It is quite possible that monkeys accompanied harvesters and may have even proved helpful on occasion. Although largely undependable, monkeys are capable of helping perform certain tasks under human supervision, especially in agricultural labor, as is the case in various countries even today.[50] More pertinent to the Knossian example are some scenes from ancient Egypt. An entire series of Old Kingdom reliefs (e.g., figs. 6–7) depict fruit harvesters at work and farmers heading for or returning from the field, accompanied by an often harnessed and leashed monkey, which they obviously purposefully brought with them. And the animal was not taken so that it could be a nuisance, but rather because it could prove useful—or amusing. In the Middle Kingdom, a well-known tomb painting from Beni Hasan shows a quaint scene of monkeys which had obviously accompanied the two men harvesting the figs (fig. 8). In the New Kingdom, monkeys are shown climbing to the tops of date palms to shake the branches and cause the dates to fall so that they could be collected (fig. 9). An equivalent job is the picking of coconuts by monkeys

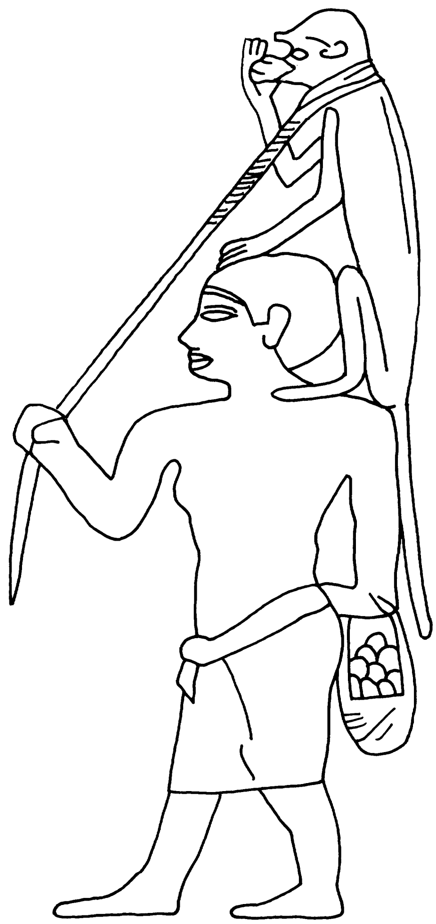

Fig. 7. Egyptian harvester carrying basket of figs and a monkey, from an Old Kingdom relief in Egypt. (G. Bianco, after K. Klebs, *Die Reliefs des alten Reiches (2980–2475 v. Chr.)* [Heidelberg 1915] 32, fig. 19)

[49] Because of the narrowness of the frieze and the scale of the monkey in the Knossian fresco, I doubt that human figures appeared along with the monkeys. The favorite scales for depicting scenes with human action in Minoan frescoes are either truly miniature, in which even crowds of people can be included (cf. Immerwahr pls. 22–23, 29), or they are very large, as in scenes covering entire walls, where depiction necessarily involves few figures (cf. infra figs. 10 and 12). The Crocus Gatherer fresco falls between these two categories and in scale it resembles most the Mycenaean equivalent of the Minoan miniature style, where figures are of an intermediate scale and the frieze covers a large part, but not the entire height, of a wall. In such frescoes there is room for a fair number of figures (cf. Immerwahr pls. 64, 66).

[50] My colleague F. Burton, Professor of Primatology at Scarborough College, University of Toronto, has amassed information that shows monkeys to have been used for a number of simple tasks by humans. To her I owe the reference to D. Morris and R. Morris, *Man and Apes* (New York 1966) 230–57, with its illuminating discussions of human exploitation of monkeys through time.

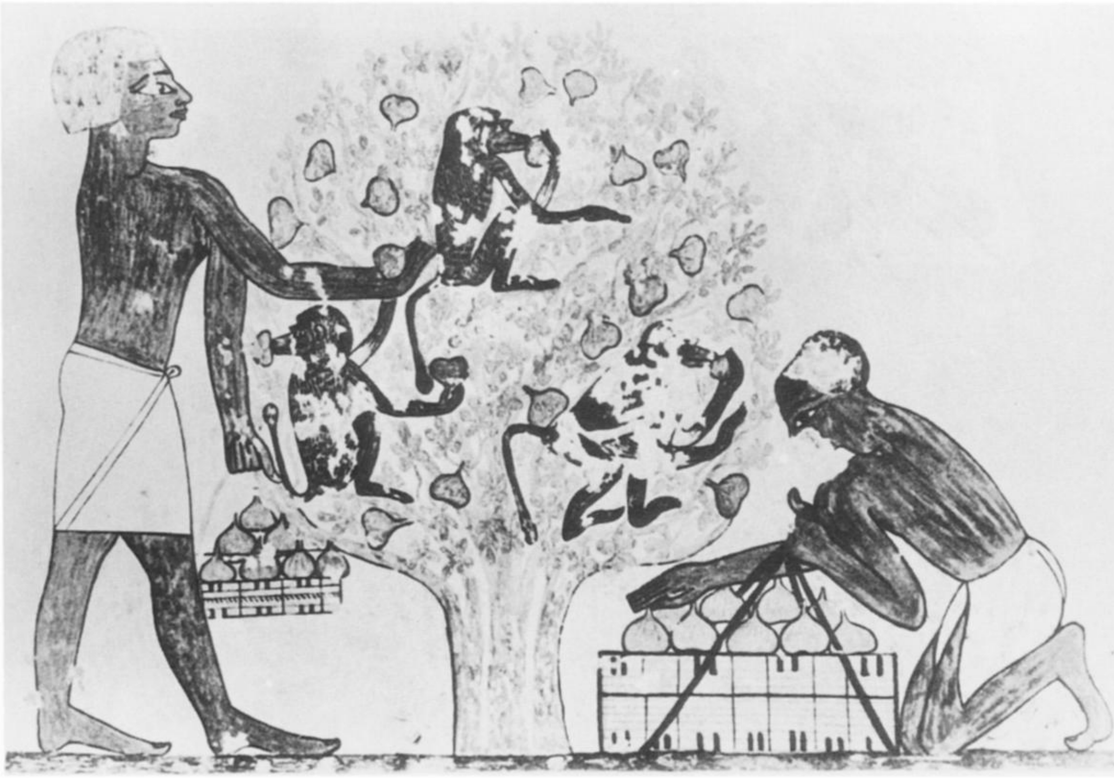

Fig. 8. Men and monkeys harvesting figs, from a Middle Kingdom painting in Egypt. (W. Stevenson Smith, *Interconnections in the Ancient Near East* [New Haven 1965] fig. 171)

Fig. 9. Woman and monkey harvesting dates, from a New Kingdom relief in Egypt. (J. Vandier d'Abbadie, *REg* 1966, 198, fig. 57)

in Southeast Asia, still practiced today.[51] Whether monkeys simply provided amusement for the Minoans in their outings to pick crocuses and other flowers or whether they actually helped is not certain. The connection with Egypt lies in the depiction of monkeys as harvesters, not in what was being harvested. Saffron, for instance, is not mentioned in Egyptian inscriptions or shown in representations. Newly published frescoes from Thera showing monkeys as musicians point to another example of the entertainment monkeys can provide, if not by their music, by their ability to mimic human musicians.[52] The itinerant musician with monkeys is as familiar a figure in Egypt and in other Near Eastern countries today as he seems to have been in ancient times.[53]

The flower-picking theme may have also been depicted in an LM I fresco from the villa at Haghia Triadha, illustrated here in Cameron's reconstruction (fig. 10).[54] The pertinent detail shows a woman kneeling next to a clump of crocus flowers, which she is presumably going to pick. It is unlikely that she has merely assumed a posture of genuflection, for such a

[51] See Morris and Morris (supra n. 50) 243–44.

[52] Doumas (supra n. 1) 134.

[53] C. Mendleson, "More Monkey Business," *AnatSt* 33 (1983) 81–83, with references to earlier bibliography on monkeys and their use in Mesopotamia.

[54] Cameron's restoration was published posthumously

Fig. 10. Restored drawing of fresco from the villa at Haghia Triadha. (M.A.S. Cameron in R. Hägg and N. Marinatos eds., *The Function of the Minoan Palaces* [Stockholm 1987] 326, fig. 10)

posture is unknown as a form of adoration in Aegean iconography of this period. The mural spreads on three walls, as if in a triptych, and the organization of its flora interestingly suggests selective cultivation. Lilies and crocus clumps appear on the left side in a rather serene, formal, and tidy setting, while on the right side other native plants, bushes, and wildflowers provide a sanctuary for animals, deer, goats, cats, and birds in a more animated composition. Are we not to see here a deliberate contrast between a milieu that has been tamed, cultivated, and used by people (hence the presence of the kneeling woman on the left side), and a pure and wild landscape, a natural sanctuary, on the right? Is the setting on the left a garden, even a religious garden? The goddess in the central wall symbolically bridges the distance between the two domains.

A more explicit scene of the harvesting of crocus flowers can be seen in the recently found fresco from Xeste 3 in Thera (fig. 11 and details in figs. 12 and 15).[55] Located in an upper story directly above a lustral basin in the building, the composition spreads on two adjacent walls. On the right wall one sees women walking on a rocky ground from which grow crocus flowers, while more clumps are scattered in the background (see also fig. 12). Each woman is provided with a basket to carry what she harvests. The harvesters' destination must be the setting shown on the left wall (fig. 11), where the product is delivered to a goddess seated on an elevated stool (see also fig. 15). Her identity as a goddess is apparent from the presence of a griffin and because the saffron is not handed directly to her by the first picker to have arrived there, but rather by a monkey acting as an intermediary. In published details of the fresco, it is clear that the monkey hands the goddess the stigmas. Stigmas are also being emptied into a basket from the smaller basket held by the girl picker.[56]

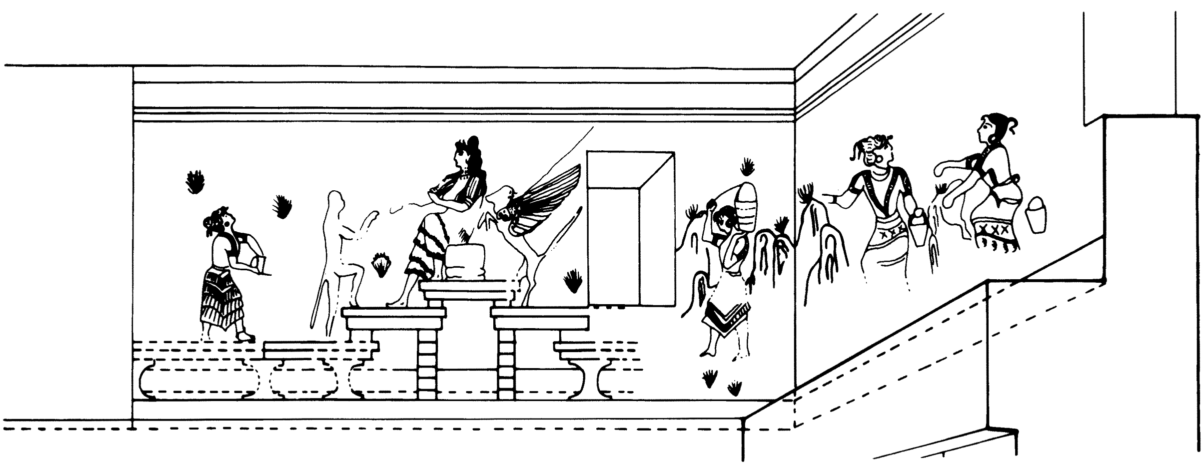

Fig. 11. Restored painting in room above the lustral basin in Xeste 3, Thera. (Detail from Immerwahr 60, fig. 20)

and, unfortunately, was incorrectly reversed (M.A.S. Cameron, "The 'Palatial' Thematic System in the Knossos Murals," in R. Hägg and N. Marinatos eds., *The Function of the Minoan Palaces* [Stockholm 1987] 321–28, fig. 10). Fig. 10, here, corrects this mistake. For details of this fresco, see W. Stevenson Smith, *Interconnections in the Ancient Near East* (New Haven 1965) figs. 106–107.

[55] See also the newly published illustrations of various details of this fresco: Doumas (supra n. 1) pls. 116–30.

[56] Doumas (supra n. 1) pls. 122–23.

Fig. 12. Detail of crocus harvesting scene, from painting above lustral basin in Xeste 3, Thera. (G. Bianco, after *TAW* III.1, cover)

It is interesting to question how the scenes on this and the adjacent wall might relate, spatially and temporally, to each other. Spatial continuity seems to be suggested by the clumps of crocus seen scattered throughout the background, on both walls. The intentional, almost mechanical repetition of crocus clumps obviously stresses the richness with which the plant grew in the area and has led one scholar to infer that this field of crocuses grows "as if destined for collection."[57] Experts agree that the flower is saffron crocus, but whether it is the wild *Crocus cartwrightianus* rather than the domesticated *Crocus sativus* is not certain.[58] It is also ambiguous whether the harvesters picked flowers, as harvesters do today,[59] or stigmas. Saffron blossoms are nearly impossible to detect in the fresco, even in the crocus clumps in the background, probably because the pigment used for the blossoms was fugitive and has vanished. This point and whether the girl on the right wall holds flowers or stigmas in her hands are details that can only be checked by direct inspection of the frescoes. If flowers were being collected, then we must assume a separate process in which the stigmas would be extracted from the blossoms. This would imply a lack of temporal continuity between the harvesting scene on the right and the delivery of the saffron on the left.

The saffron itself, which is derived from the stigmas only, was highly prized in antiquity for its many uses, such as dye for fabrics, food seasoning, and medicine, as it is prized in some ways today.[60] It is common knowledge that to produce even an ounce of saffron requires a huge supply of flowers.[61] Even if the scene

[57] Douskos (supra n. 15) 141.

[58] Douskos (supra n. 15) expresses two conflicting opinions about the type of crocus shown in the Theran fresco: on p. 141 she describes it as *C. sativus* (the domesticated variety), but on p. 143 as *C. cartwrightianus* (the wild variety). Ray Porter believes that the domesticated variety was probably not yet known (personal communication, 17 May 1991). By contrast, Amigues (supra n. 15) 230 is inclined to think that *C. sativus* is shown because of the large quantities of saffron suggested in the fresco.

[59] Amigues (supra n. 15) 231–32 and ns. 12–13.

[60] F.I. Ihde, "Saffron, Kashmir's Pot of Gold," *New York Times* (4 October 1987) X6:1.

[61] It has been estimated that some 50 stigmas will produce 0.4 g of saffron. See Amigues (supra n. 15) 232, n. 13.

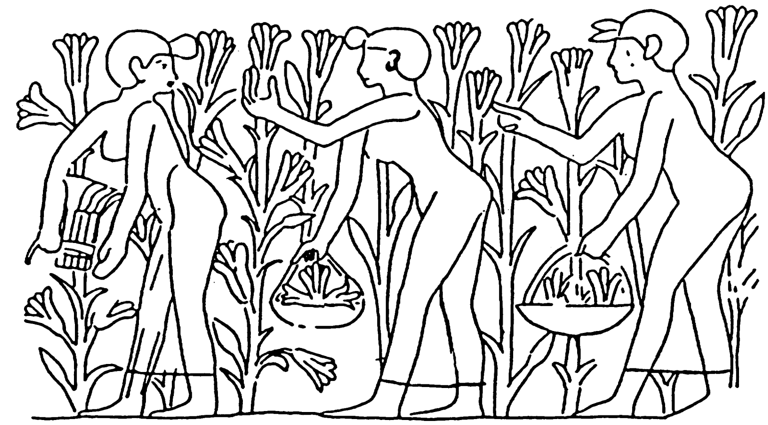

Fig. 13. Women harvesting flowers, from painting of the late New Kingdom in Egypt. (J.-C. Hugonot, *Le jardin dans l'Égypte ancienne* [Frankfurt 1989] 266, fig. 255)

in the fresco depicts merely a ritual reenactment—and objections have been raised that the women are too well dressed to be workers—it must still reflect real settings and organized harvesting for utilitarian purposes. The handing-over of this rich product to the goddess is surrounded by an aura of magic. The monkey, clearly imbued with religious symbolism, as monkeys are in many cultures even today, adds to the mystery of the occasion.[62]

The Theran fresco allows us to understand better the Crocus Gatherer fresco from Knossos, which depicts similar acts, but with different actors. In the Theran fresco the monkey is honored as the agent who conveys the precious product to the goddess. In the Knossian fresco the monkey performs a related role: that of a harvester, real or symbolic. Among the humans involved, the women seem to be the designated crocus gatherers, as women often are in countries that produce saffron today (mostly in Spain and Kashmir on the slopes of the Himalayan Mountains). Like the ancient Egyptian farmers (who were generally male), the Aegean women harvesters may have had monkeys as pets and as work companions who could prove useful as helpers. In Egypt the harvesting of flowers is done by both women and men, sometimes working together (figs. 13–14). There is a striking resemblance in the way that the women make eye contact, as if conversing, both in the Egyptian example of women harvesters (fig. 13), and in the Theran fresco of the saffron gatherers (fig. 12). This is where similarities end, however, for the flowers picked are different.

Fig. 14. Men and women harvesting flowers, Old Kingdom relief in Egypt. (N. de G. Davies, *The Rock Tombs of Deir el Gebrawi* 2 [London 1903] pl. V)

[62] See *Art and Religion* 112–16, and N. Marinatos, "An Offering of Saffron to the Minoan Goddess of Nature," in T. Linders and G. Nordquist eds., *Gifts to the Gods* (Uppsala 1987) 123–32, where she has discussed the role of the monkey in this scene and in other Aegean depictions. For the sacred nature of the ape in other cultures, see Morris and Morris (supra n. 50) 10–26.

Fig. 15. Restored fresco from a room over the lustral basin in Xeste 3, Thera. (N. Marinatos in *TAW* III.1 [London 1990] 374, fig. 4)

Although chronologically distant, the Theran painting has affinities with the mural decoration of the Throne Room in the palace at Knossos, especially as it is considered here, as an integral part of its physical context. As I have discussed in an earlier publication,[63] there is a shared imagery between the Theran fresco and the painted room at Knossos, one that combines both the subject matter illustrated in the frescoes and the visual impact of the features of the room. Two drawings (figs. 15–16) help to illustrate this point. Benches occur in both cases: actual ones in stone at Knossos, painted ones at Thera. The benches flank a seat marked as special, either by the fact that it was central (the throne at Knossos), or because it was elevated (in the painting from Thera).[64] In the Theran fresco, the pedestals that support a plank or a board to form a bench assume the form of the well-known "waisted" altars. Four altars of this shape found together in the LM I building at Archanes may have also served as supports for such benches, which may have been set up in certain occasions in that building, perhaps in unroofed areas.[65] The benches at Knossos have no pedestals, possibly because they were built entirely in stone, while the Theran structure depicted was mainly made of wood, as is now clear from a recently published color illustration of

[63] Shaw (supra n. 38) 117–18, 120–21. The drawing in fig. 16 here combines information based on two drawings by Cameron (supra n. 54) 322, fig. 3 and 323, fig. 7, one a restoration, the other a detail of the fresco in back of the throne in the Throne Room at Knossos in its architectural setting. The palms seen in Cameron's restoration had been omitted in Gilliéron's earlier reconstruction, even though at least one palm tree was still visible on the wall next to the throne when the room was excavated (see *PM* IV, 906, fig. 881). For an earlier version of the Throne Room fresco (without the palms), see also H. Reusch, "Zum Wandschmuck des Thronsaales in Knossos," in *Minoica und Homer* (Berlin 1958) pl. 6b.

[64] Perhaps the seat in the Theran fresco was also meant to be seen as central and the representation shows only a portion of the bench on the right, which thus looks shorter. Such structures may have been symmetrical, and intentionally reflected the appearance of the Minoan tripartite shrines.

[65] Shaw (supra n. 38) 120.

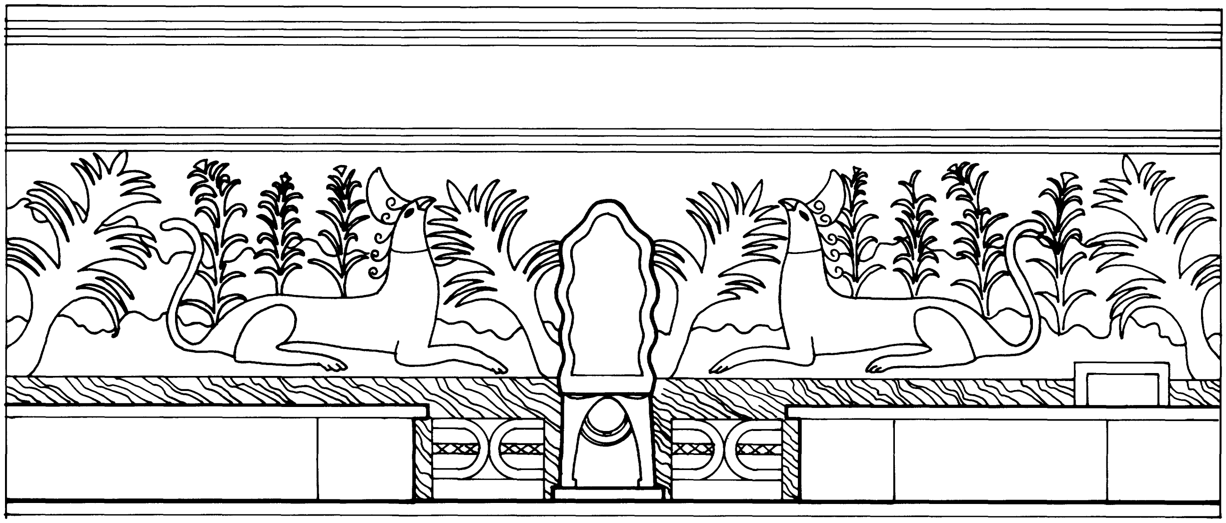

Fig. 16. Restored view of the Throne Room at Knossos. (Drawing by G. Bianco, adapted from M.A.S. Cameron in R. Hägg and N. Marinatos eds., *The Function of the Minoan Palaces* [Athens 1987] 322, fig. 3 and 323, fig. 7)

this detail.[66] Nevertheless, the symbol of the altar with incurved sides may still occur in the Throne Room at Knossos, if we agree with Evans's identification of two patterns painted on the wall on either side of the throne as two stylized altars. Amazingly, Evans offered this interpretation without the benefit of information now available in the Theran frescoes.[67]

To continue with correspondences between the Knossian Throne Room and the Theran fresco, the benches and the special seat appear against a floral backdrop in both cases. In the Theran fresco this is a field or meadow of crocus flowers. At Knossos it is a landscape of reeds and palms rising from rocky ground. Griffins, as protectors of the occupant of the special seat, appear in both occasions, as part of the scenery at Knossos and accompanying the seated goddess at Thera.

In a sense, at Knossos we seem to have a concrete and modified version of the painted bench and seat at Thera. Absent from Knossos are the monkey and the goddess. Various kinds of animals and monsters can serve as intermediaries between divinities and mortals, and this may be the reason for the lack of a monkey in the scene at Knossos. On the other hand, a crocus-gathering monkey appears in the fresco from the palace discussed above (fig. 5). As for the absence of a goddess at Knossos, it depends on who occupied the throne when the occasion arose, for the room was obviously set up for special occasions when a number of participants would gather. I tend to agree with H. Reusch's well-argued theory, proposed many years ago, that a priestess or a goddess sat on what I prefer to call "a seat of religious authority," rather than a throne, because of the term's misleading modern connotations of secular power and kingship.[68] The appearance or epiphany of such an individual would thus pull together even more closely the totality of images and symbols in the two rooms under consideration at Thera and at Knossos.

S. Mirié's important study has shown that the Throne Room (including the benches and other aspects of its plan) goes back to a much earlier period in the palace at Knossos.[69] In light of this interpretation, one might even consider the possibility that the Knossian fresco is closely linked to the symbolism of the room as defined in an earlier phase of its use. Conceivably, the fresco with the griffins and their exotic landscape may have had an iconographically

[66] Doumas (supra n. 1) pl. 122.

[67] The altars here are evoked rather abstractly by the negative spaces created between adjacent patterns in the form of half-ovals (see *PM* II, 607–608). At Knossos such "altars" are not shown in a functional role as pedestals, as they are in Theran frescoes. Their supportive role here may have been of a symbolic nature, conveyed by their being placed on either side of the throne and next to the benches.

[68] See Reusch (supra n. 63) 334–50. The idea that the Throne Room is where the epiphany of the goddess occurred finds support in a more recent study, W.-D. Niemeier, "Zur Deutung des Thronraumes im Palast von Knossos," *AM* 101 (1986) 63–95.

[69] S. Mirié, *Das Thronraumreal des Palastes von Knossos. Versuch einer Neuinterpretation seiner Entstehung und seiner Funktion* (Berlin 1979). This theory is supported by and further discussed in an illuminating way by Niemeier (supra n. 68).

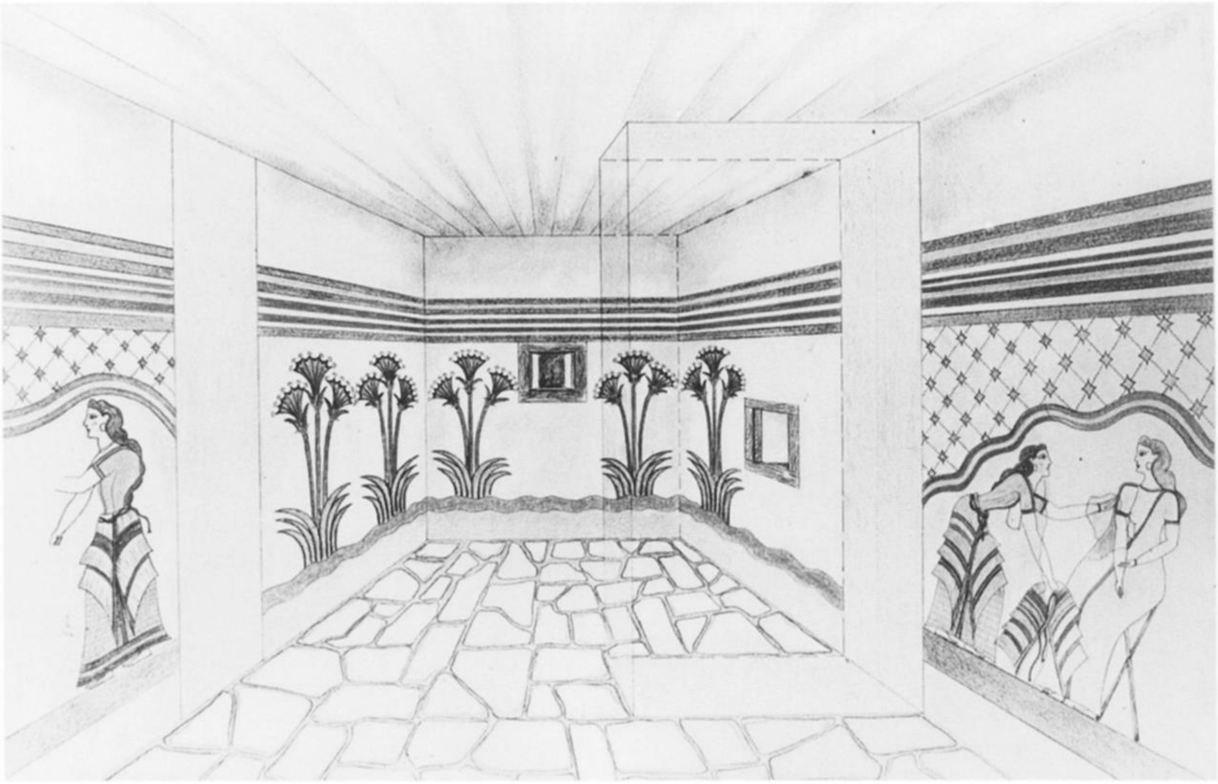

Fig. 17. Restored view of two painted rooms in the House of the Ladies, Thera. (Detail from *Art and Religion* 96, fig. 69)

similar predecessor, either specifically in the mural decoration in the room, or in themes prevalent in art in an earlier age, as is suggested from the painting from Thera.

What we may then have in the Throne Room at Knossos is a recollection of an ancestral ritual in which a structure like the one seen at Thera was set up in the open, either occasionally for special events or as a permanent fixture that was used periodically for religious ceremonies.[70] In the Throne Room at Knossos, the benches are built, and the painted landscape is symmetrical and formal in appearance and style, as is to be expected from its later date and palatial context. The difference in flora between the two cases clearly suggests a different natural setting. The landscape at Thera appears to be native, that at Knossos exotic and fantastic. Perhaps the Knossian fresco no longer represented a real place, but rather the idea of a floral setting. What is ultimately important is the Minoan or early Aegean character of the Throne Room, even at this late date. That the use of such a structure may not have been uncommon is seen from its depiction in seals and possibly in the fresco from the villa at Haghia Triadha (fig. 10).[71] In this fresco,

[70] Perhaps the presence of a tripartite shrine in the palace at Knossos is another case in which a structure that was usually set outdoors was adapted for use indoors and is incorporated in the architecture of the palace. The best representation in art of a tripartite shrine is the carved relief on the LM I Sanctuary Rhyton from the palace at Zakros. For a discussion of this elusive type of a Minoan shrine, see J.W. Shaw, "Evidence for the Minoan Tripartite Shrine," *AJA* 82 (1978) 429–48.

For a view that the building in the Zakros relief was not set on a mountain, but was rather an integral part of the architecture of the palace at Zakros, see E.F. Bloedow, "The 'Sanctuary Rhyton' from Zakros: What Do the Goats Mean?" *Annales d'archéologie égéenne de l'Université de Liège* (*Aegaeum* 6, Liège 1990) 66–67. Such a connection, however, does not seem to find support in the actual architecture of the palace of Zakros. The rocky ground and apparent remoteness of the building in the relief suggest that the shrine was set in a thoroughly wild landscape, a mountainside. Here again, strangely, only crocus flowers seem to grow. An interesting talk on the rendition of space in the landscape of the Zakros rhyton was recently given at the 93rd Annual AIA Meeting by A.P. Chapin, "The Sanctuary Rhyton from Kato Zakros and the Representation of Space in Aegean Art of the Bronze Age," *AJA* 96 (1992) 334 (abstract).

[71] The suggestion that such a structure originates in Minoan iconography was made in a recent study by N. Marinatos, who has studied the occurrence of the bench and seat arrangement in artistic representation, especially in seals: "Minoan-Cycladic Syncretism," in *TAW* III.1, 370–76, esp. 372–74. The structure, which Marinatos has suitably called "the platform of the goddess," does not appear in seals in association with floral settings. Perhaps the omission is due to the abbreviated character of depiction in such a medium.

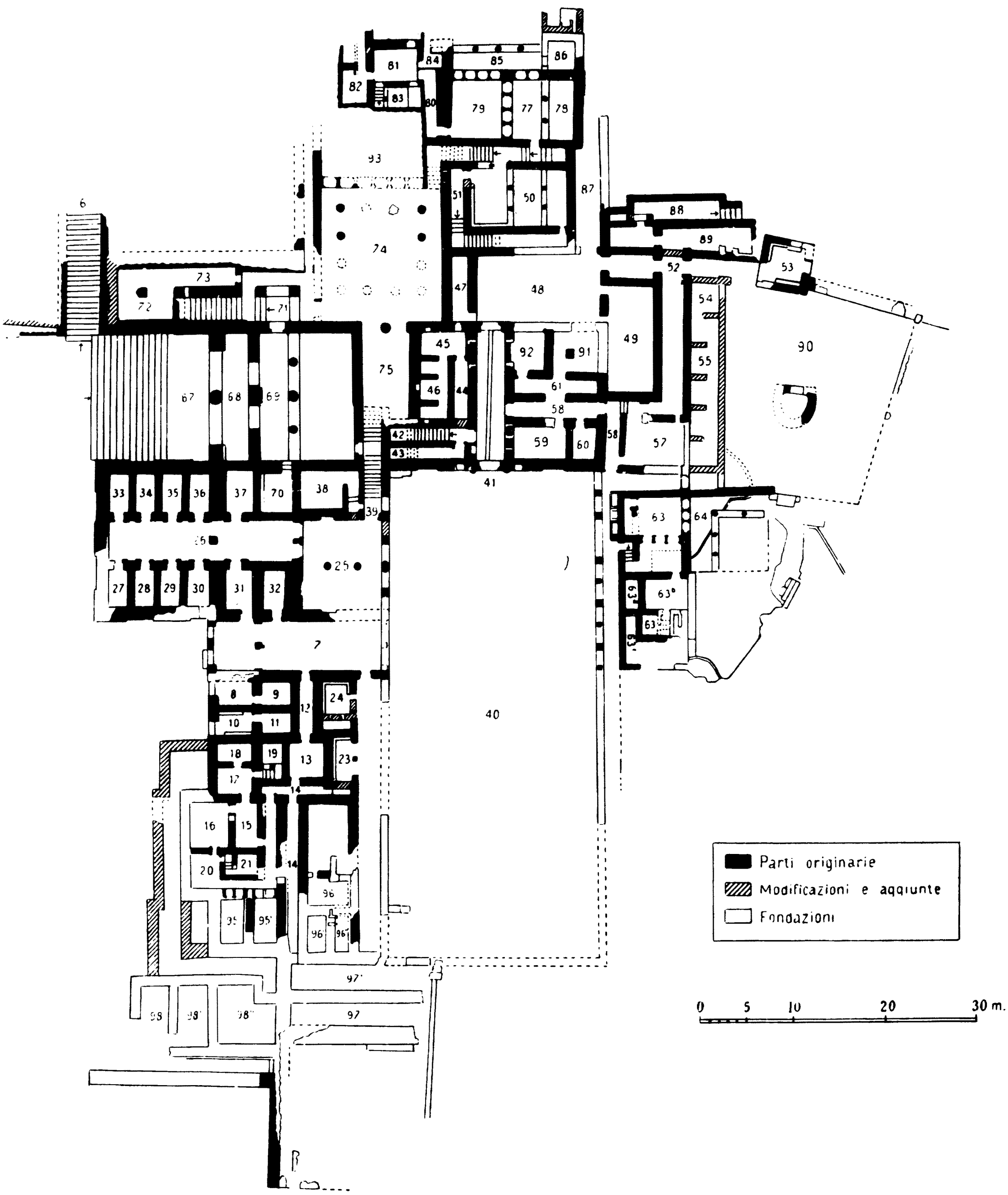

Fig. 18. Plan of the palace at Phaistos. (After *Festòs* II, 484, fig. 285)

a poorly preserved architectonic representation is in the center of the composition, once again associated with a woman or goddess, and once again placed within a floral setting.

In our search for connections between architectural and architectonic structures and the use of nature for their setting, the last example to be examined occurs in the House of the Ladies at Thera (fig. 17). Frescoes occur in two adjacent rooms: one depicting a ritual enacted in an indoor space, to judge from what appears to be a wall hanging with woven or embroidered patterns, the other a landscape with papyrus clumps rising from a ground rendered by wavy bands. It is with the latter that we are concerned, and once again, the question arises whether it represents selective cultivation of a religiously relevant plant (for papyrus was imported and had to be planted) or whether it is an imaginary landscape inhabited exclusively by symbolically appropriate flowers. Interesting is the sequence of indoor and outdoor settings in the representations of the two successive rooms. It seems to convey the idea of a room or a building set next to a floral setting, but whether cultivated or natural we cannot tell.

Fig. 19. View of rocky outcrop next to court 64 in the palace at Phaistos, from the south. (Photo J.W. Shaw)

ARCHITECTURE AND GARDENS

The idea that gardens may have occurred next to and as part of Minoan buildings is not novel. Sir Arthur Evans had thought that flowering plants may have been set in light wells in Minoan buildings and in the central courts of the palaces.[72] Other open spaces, like windows, now appear to have also been adorned with flowerpots or flower vases, as suggested by paintings of such items on the actual window jambs in the West House at Thera, already discussed. Excavators have upon occasion suggested gardens for their sites: N. Platon an orchard just southeast of the palace at Zakros, J.A. MacGillivray a possible garden between houses in the town of Palaikastro, and E. La Rosa a possible grove south of the Piazzale dei Sacelli at Haghia Triadha.[73]

It was, however, J. Walter Graham who first looked systematically for evidence of gardens in the context of his studies of Minoan architecture, and with special reference to the palaces. One of his interesting suggestions was that there were terraced gardens opening off porticoes. He restored such gardens outside the portico of the Hall of the Double Axes in the residential wing of the palace at Knossos, outside the portico in the north wing of the palace at Phaistos, and outside the portico at the north end of the west wing of the palace at Malia.[74] Graham suggested another garden at Phaistos, "along the edge of the steep slope to the valley" in the southeast corner of the east wing of the palace (fig. 18).[75] I would like to suggest that we can be more specific about the evidence in this case, and that there was a particular location that would have been perfect for a Minoan rock garden.

The feature concerned is a rocky outcrop that was intentionally incorporated into the landscaping of the palace (fig. 19). The area was surveyed by the author and Giuliana Bianco recently, and Bianco drew a plan and cross-section of the rock itself. Together, the drawings clarify the physical relationship between the rock and the adjacent architecture (figs. 18, 20).[76] The rock occupies an irregular area tucked in the corner formed between court 64 to the north and the complex of a lustral basin (63d) with a corridor and auxiliary spaces to the west. A rich deposit of ritual vessels and precious objects was found in the lustral basin.[77] The rock can be reached directly from the little court, but it is separated in part from the lustral basin complex by a wall. The only possible access from that

[72] *PM* III, 277–79.

[73] Some of these attributions are discussed with accompanying bibliographical references in Schäfer 85. For the information on Palaikastro and Haghia Triadha I would like to thank J.A. MacGillivray (personal communication) and E. La Rosa, who also supplied me with a reference to his published mention of the grove in *Kritiki Estia* 2 (1988) 330.

[74] J.W. Graham, *The Palaces of Crete*, rev. ed. (Princeton 1987) 87, 89, 91, 95, 123, and 241.

[75] Graham (supra n. 74) 91.

[76] The area was surveyed in the summer of 1992 by Giuliana Bianco with the help of the author. Permission to make a plan was kindly granted by the Scuola archeologica italiana di Atene and its director, A. Di Vita, and by the Greek Archaeological Service. I am also grateful to E. La Rosa for his encouragement and advice on this project.

[77] *Festòs* II, 171–78.

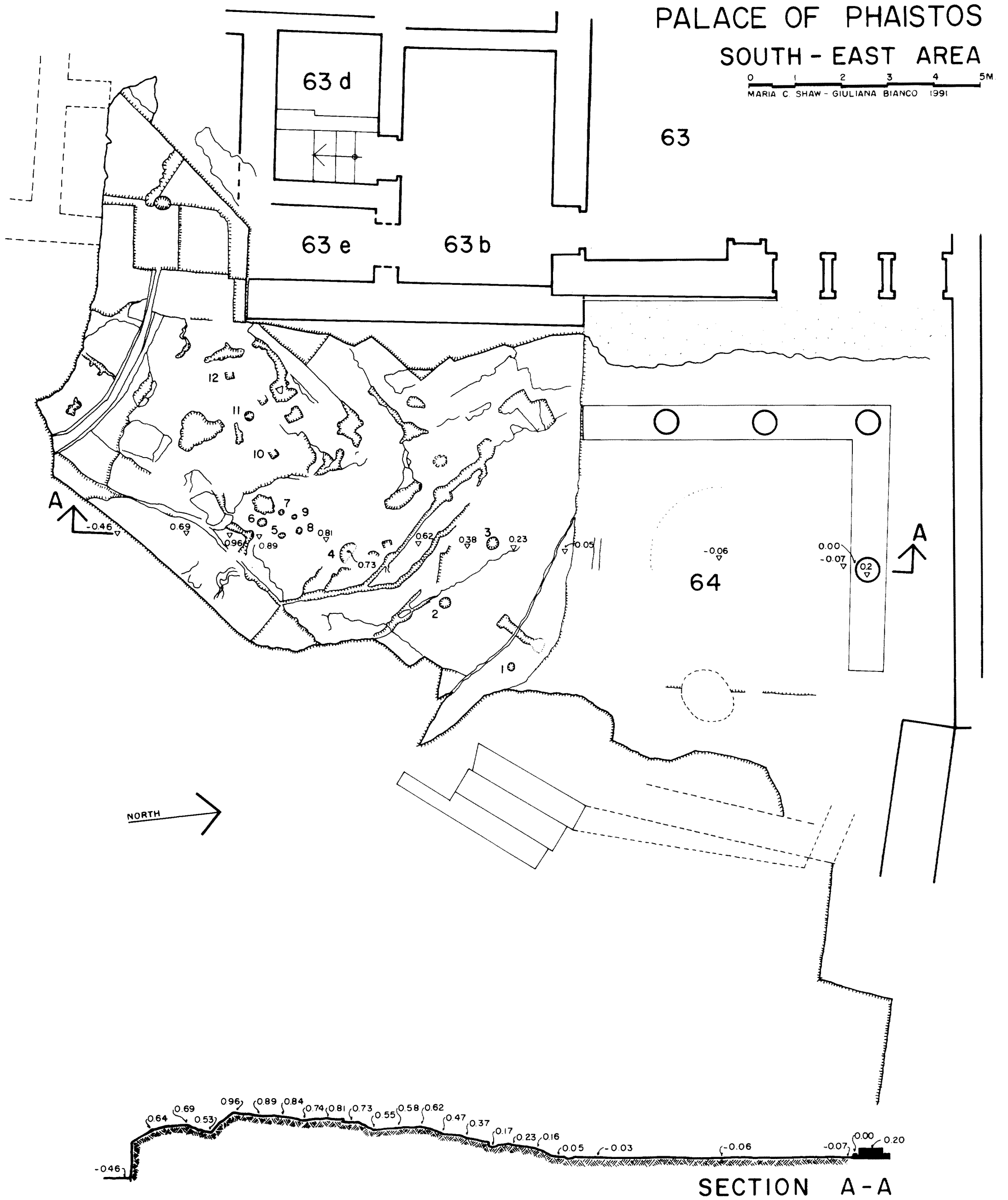

Fig. 20. Plan and section of rocky outcrop and adjacent architecture in the palace at Phaistos. (G. Bianco)

direction might have been through the south side of room 63e, but this is far from certain, for the wall is too destroyed to determine whether it had a door.

The rock was cut back and trimmed with the use of tools on several sides. In the southwest area, remnants of tooling are evident on the rock next to the walls on the west, including some rectangular cuttings that look like beddings for two to three building blocks. Perhaps the purpose of the cuttings, however, was simply to level the area, so that it could be used in conjunction with a drain that was cut diagonally through the south end of the rock. The Italian excavators interpreted space 63c, directly east of the lustral basin (63d), as a bathroom, the drain being used to carry water away.[78] Whether room 63c was a bathroom or whether there was a drain inside it can no longer be ascertained, again because much of its south wall is missing.

[78] *Festòs* II, 178–81.

Fig. 21. Holes and cracks in rocky outcrop depicted in figure 19. (Photo J.W. Shaw)

Further north, the rock was also cut in a straight line to define the south side of the little court, space 64 (fig. 20).[79] Indeed, the rock had originally extended further north and was cut back and leveled to make room for the court, the leveled part of the rock serving as the bedding for the court's floor. This is now destroyed, but it seems to have been once paved with a mixture of earth, plaster, and pebbles. The court was provided with an L-shaped portico that had three columns on the west and one column on the north, all set in a low stylobate built of limestone slabs. The portico would have provided shade and a unique point from which to contemplate the beautiful landscape unfolding before one's eyes to the east and south. From here were visible a large valley below and mountains beyond, for there was no further construction on this side where the hill slopes down steeply.

From the court and the portico one could gain direct access only to the west to the large Minoan hall 63, which in turn led through a series of pier and door partitions to the lustral basin complex. To the north of the court a wall blocked direct access to the rooms and other spaces of the northeast wing of the palace. It appears, then, that all the spaces described in connection with the court and portico formed a self-contained architectural unit that enjoyed a degree of privacy. On the southeast area three steps led down toward the hill slope.

[79] The straight line of the rock on the southeast side is probably accidental due to natural cleavage. Note, for instance, what may be another line of cleavage parallel to the edge. The rock, as the section shows (fig. 20), is at its highest along the edge with the vertical face.

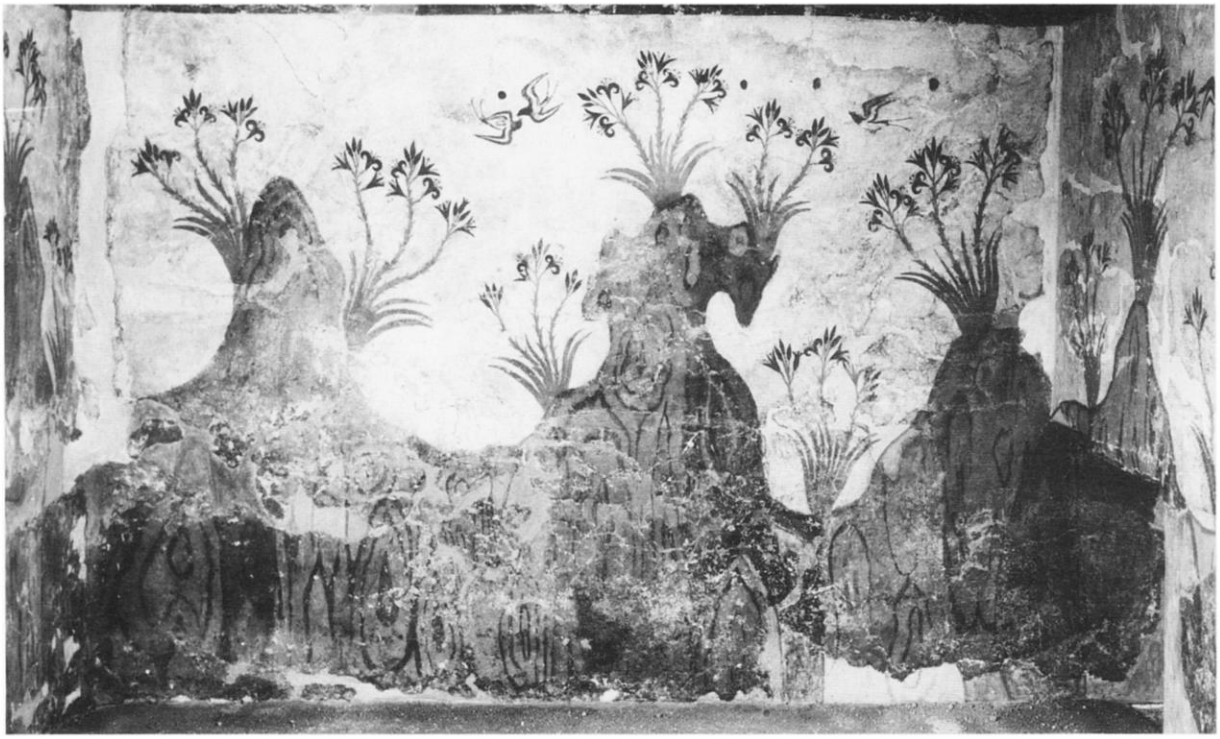

Fig. 22. Spring Fresco from Thera. (Courtesy TAPA)

The rock is now bare of soil, but this may be the result of energetic excavation and gradual erosion. Most interestingly, its surface is marked by roundish holes: some perhaps natural, but others almost certainly man-made, being relatively deep and cylindrical in shape. The holes were unevenly scattered, but were largely concentrated on a slope near the court (figs. 20–21). Typically, the rock is also marked by natural fissures where earth could accumulate. The varying sizes of the holes (mostly in the range of 10–30 cm wide and 6–10 cm deep),[80] as well as their uneven distribution, make it clear that they could not have supported a scaffolding, as Banti hesitatingly suggested, though one or two squarish ones may have had a comparable but undefinable function.[81] Possibly pots with planted flowers were placed in the larger and shallower holes.

Some of the holes themselves may have been used for planting bulb or corm plants.[82] R. Porter has advised me that wild saffron with its small corms requires holes at least 8–10 cm deep, and the domesticated variety 18–25 cm deep.[83] The size of the holes at Phaistos is such that clearly only wild crocus corms could have been accommodated, unless the ample width of the holes compensated for their relatively shallow depth (figs. 20–21). Other plants, such as miniature iris (*Iris unquicularis*) and fragrant violet (*Cifola odorata*), ivy, and aromatic herbs, could also have been planted.[84] One concern of some of my botanical advisors, however, was the matter of water-

[80] The main holes have been labeled with Arabic numerals in the plan here (fig. 20). A few were drawn, but not numbered, and are probably natural. The measurements of those numbered are given in centimeters (length × width × depth): 1) 17 × 14.5 × 10; 2) 24 × 21 × 10–20; 3) 24 × 27 × 1–6; 4) 41 × 30 × 6; 5) 15 × 12 × 9–15; 6) 18 × 14 × 10–12; 7) 10 × 10 × 5–6; 8) 10 × 8 × 4.5; 9) 10 × 10 × 5; 10) 20 × 20 × 10; 11) 19 × 20 × 10; and 12) 15 × 18 × 0–8.

[81] *Festòs* II, 186. A well that was cut into the court is of unknown date. The presence of Middle Minoan pottery in it suggests that this was the well's actual date, and it may have been reused in Hellenistic times, for there is evidence for use in the larger area during that period (*Festòs* II, 183–85).

[82] I have consulted a number of botanists and horticulturalists on this matter. I would like to express my thanks to Reeves's Nursery in Woodbridge, Ontario, O. Rackham (for his letter of 1 January 1991), and especially Ray Porter (correspondence mainly in the spring of 1991).

[83] Letter of 17 May 1991.

[84] As suggested to me by R. Porter (letter of 29 September 1991).

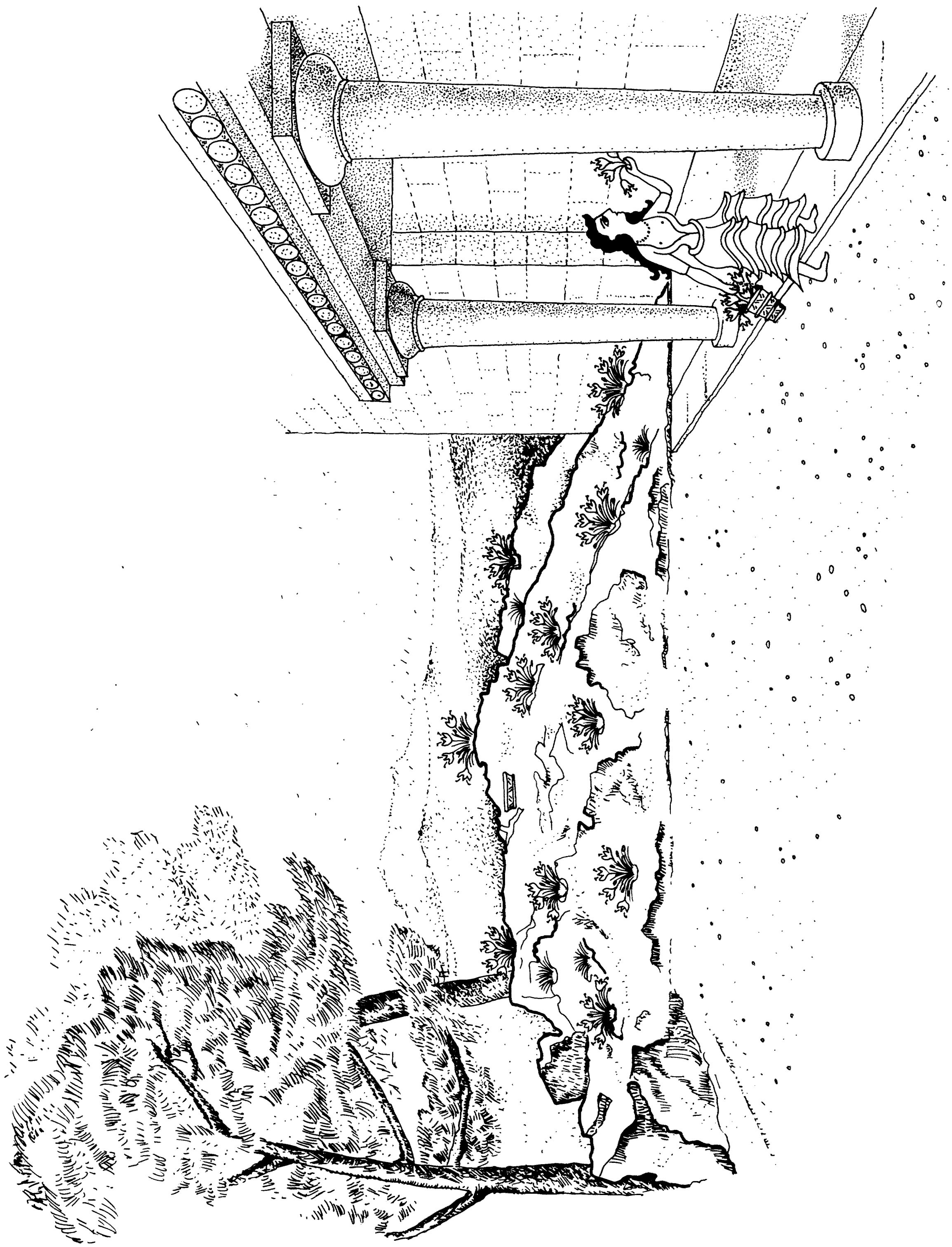

Fig. 23. Tentative restoration of a rock garden in the palace at Phaistos. (M.C. Shaw and G. Bianco)

logging. Such a problem would be eliminated to some extent, I was told, if the bulbs were removed and renewed seasonally. The plants could have first been forced indoors in pots and then brought outside. Some of the holes are shallower on one side and many are on a slant, since they are on a slope, which would have helped with drainage, as would the possible use of gravel at the bottom of the holes. Perhaps water-logging was not such a problem, given the relatively dry Cretan climate and the fact that the rock itself is rather porous.

The planting of varieties of wildflowers, especially for religious purposes, is practiced even today. R. Porter called to my attention, for instance, the planting of white wild lilies at Easter time in Greece today.[85] When we turn to Minoan Crete with its obvious connections between flowers and ritual, the likelihood increases that the Minoans also planted wild and other flowers on special occasions. At Phaistos wild and other flowers that were seasonally changed may have been cultivated. The use and deliberate exposure of the rock in the court would thus be partly explained. Lilies, possibly along with other flowers, could have been planted in other Minoan rock gardens that may have escaped notice (at Phaistos the holes were too small for the large bulbs of lilies). The Spring Fresco, from room D2 in one of the houses at Thera (fig. 22), depicts only lilies gracefully rising from the rock and helps us visualize what such a garden might have looked like. The garden suggested to have existed at Phaistos is shown in our restoration (fig. 23) as if planted only with saffron crocus, as it might have appeared in autumn. Perhaps selective cultivation was intended to emphasize the one plant that Minoans considered expressive of the essence of a season: lilies for spring, saffron crocus for fall.

Given the particular location of the garden at Phaistos, it is also tempting to think that it might have been connected symbolically with the lustral basin nearby, and that it may have had a religious meaning, in addition to being a pleasure to the eyes. If so, it would have been a sacred garden that was also cultivated, one in which the naturalness of the original landscape was largely maintained. Had such a garden been portrayed in a fresco, it might well have appeared not as a real garden, but as an untamed landscape, especially when compared with the still unique formal garden shown in the Amnisos fresco.

DIVISION OF HUMANITIES
SCARBOROUGH COLLEGE AND
DEPARTMENT OF FINE ART
UNIVERSITY OF TORONTO
TORONTO, ONTARIO
M5S 1A1 CANADA

[85] Personal communication, 17 May 1991.

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Elizabeth Macaulay-Lewis

Imported Exotica: Approaches to the Study of the Ancient Plant Trade

Introduction

"But who would not be justifiably surprised to hear that a tree has been procured from another clime merely for the sake of shade? This tree is the plane"[1].

In this passage from the Natural History, Pliny lambastes the plane tree (*Platanus orientalis* L.*);* he calls it a luxurious, eastern plant, which produced no fruit, but only shade. It was the botanical embodiment of the decline in Roman values brought about through contact with the Hellenistic and eastern world. To the modern ears this diatribe might seem out of place. What had this poor *platanus* done to deserve such criticism? In Pliny's day, its benevolent branches cast cool shade over the streets and public gardens of Rome. But in Pliny's eyes, it was what the tree had not done – yielding no fruit or useful wood – that made it such an unworthy plant[2]. Furthermore, it was an interloper, a foreign species. That said, not all foreign plants were vilified; balsam and other incense producing plants were actively sought by the Romans[3]. This passage highlights that a plant is rarely just a plant. Not only do plants have economic value, but they are also the vegetal incarnation of a society's cultural, political and social values[4]. Plants, their cultivation, use, significance, and migration not only tell us a great deal about antiquity, but about each civilization of this era.

Traditionally, the study of garden plants has been quite limited in scope[5]. Scholars have tended to view plants as ephemeral bits of the past that could only be studied through ancient literary and visual sources. The advent of modern scientific, archaeological techniques, as well as the development of garden archaeology and archaeobotany, has enabled us to identify the actual plants found in ancient gardens, particularly those in full summer foliage buried by Mount Vesuvius that August day of AD 79. The result has been the publication of short catalogs, often in the form of herbals, especially about the plants in Pompeii[6].

[1] Plin., *NH* XII.iii.VI, "Sed quis non iure miretur arborem umbrae gratia tantum ex alieno petitam orbe? Platanus haec est". For a less negative view of the plane, see Seneca, Ep., XII.II when he bemoans the treatment of the plane trees on his estate.

[2] Not all authors criticise the plane tree for its lack of productive foliage and seeds. The plane tree was closely associated with philosophy throughout antiquity. Many philosophers from the Hellenistic era were thought to have lectured under the shade of plane trees. In the Roman period, the plane was in demand for the gardens of private villas where elite men walked for leisure, discussing philosophy. See MACAULAY-LEWIS 2008b, 47–77.

[3] See *infra*, 11.

[4] A similar observation has been made about Roman food; food consumption is reflective of larger cultural choices and identity. See VAN DER VEEN 2003a; 2008; BAKELS, JACOMET 2003.

[5] The archaeological study of Roman food, its consumption, and production has flourished in recent years, demonstrating a well development trade network of foodstuffs within and beyond the boundaries of the Roman Empire. The work of van der Veen in Roman Britain, Egypt and is particularly noteworthy; for her work and further bibliography, see VAN DER VEEN 2003a; 2003b; 2007; 2008.

[6] JASHEMSKI *ET AL.* 2006, 80–180; MANNICHE 2006[2]; RYLEY 1998; CIARALLO 2004.

These herbals are essential building blocks in the study of ancient plants. Yet, they often do little beyond listing the plants with photographs or drawings and short descriptions, like a modern-day floral field guide. Another area where scholars have shown considerable interest is in the symbolism and iconography of plants[7]; these studies, however, tend to focus on representations and need to be linked to archaeological evidence. With new gardens excavated each year, it is an ideal time to pose new questions about the origins and the place of plants in the Roman garden and its design.

This paper proposes a new method for looking at the trade for plant collecting and display[8]. I divide my discussion into two parts. First, I examine the evidence for ancient plants and whether this information is sufficient to address questions we want to ask in archaeologically excavated gardens. Second, I develop an approach, drawing upon the known classes of evidence, for the study of the ancient plant trade and apply this to ancient Rome and the issues of plant display. I conclude that the evidence is insufficient as yet to model plant trade; currently, the nature of the evidence presents certain limitations. However, this brief paper suggests that a trans-disciplinary approach, employing new scientific techniques and utilitizing the nascent field of garden archaeology and other underused sources of evidence, to the study of ancient plants can eventually lead to a model of the trade of ancient plants[9].

Part I: the Nature of the Evidence

There is a surprisingly wide range of evidence for ancient plants and their trade. There are three major categories: 1) literary and historical; 2) art historical; and 3) archaeological and archaeobotanical. Although scattered, literary references to the ancient plant trade, the origin of plants, where the best plants are found, and why they were traded are abundant. Table 1 offers a partial list of the authors who specifically wrote on plants[10]. (Table 1).

Author	Work(s)	Date
Theophrastus	*Enquiry into Plants* *On the Causes of Plants*	early 3rd C BC
Cato the Elder	*De Agri Cultura*	3rd / 2nd C BC
Varro	*De Re Rustica*	1st C BC
Pliny the Elder	*Historia Naturalis*	1st C AD
Columella	*De Re Rustica*	1st C AD
-----------	*Periplus Maris Erythraei (*sailing manual, mentioning ports for incense trade)	AD 40 - 70

[7] SAURON'S 2000 study is the most comprehensive. Also see CASTRIOTA 1996, on the *Ara Pacis*; BAUMANN 2000, on Greek coins; MACAULAY-LEWIS 2008a, on plants and the Flavian dynasty.
[8] Previous studies have demonstrated that plants moved across tremendous geographic areas in antiquity. Pompeii's diverse *flora*, which included species from as far as a way as China, testifies to this. See JASHEMSKI *ET AL.* 2002, 137; 152; and CIARALLO 2000, 6. See *supra*, nn. 4-5.
[9] This paper does not aim to consider plants as food, but rather focuses on plants for gardens and horticulture.
[10] Numerous authors, like Horace and Virgil, were interested in pastoral or agricultural ideals. However, they do not discuss plants, their significance and their movements in detail and so are not directly relevant to this study.

Author	**Work(s)**	**Date**
-----------	The Alexandrian Tariff (Issued under Marcus Aurelius, it lists 54 plant items that were taxed at Alexandria on route to Rome)	AD 176-180
Galen	various writings	2nd C AD
Apicius	*De re conquinaria*	4th C AD
Palladius	*Opus Agriculturae*	mid 5th C AD

Table 1. The major ancient sources discussing ancient plants in some capacity.

These authors also provide insight into the ancient perception, use and significance of plants. Pliny the Elder, in particular, is the first to note his sources on the subject systematically. Many other literary sources provide the names of plants in association with myth, legend, historical events, or poetry that offer critical insights into the cultural use of plants, if not much scientific information. Of particular interest to the trade of ancient plants, are the *Periplus Maris Erythraei* and the Alexandrian Tariff. They enumerate the plants that entered the Roman Empire via Egypt (in particular Myos Hormos and Berenike) from India, Africa and Arabia and in the case of the Alexandria Tariff, twenty different plant products were listed as being subject to duty[11]. With the exception of clover (yellow) (*Melilotus officinalis* L.) Pallas and nard (-spike) (*Cymbopogon schoenanthus* L.) Spreng[12], which were present as whole plants, the other forty-three foreign plants listed were trade in the form of roots, wood, bark, secretations (for example, resin), leaf, and flower[13], suggesting that plants were imported into Egypt in various forms.

There is also considerable epigraphic and documentary evidence that has yet to be fully exploited. Jashemski, for example, has used graffiti successfully in her study of Pompeian plants[14]. The cargo lists of ships, papyri and ostraka from Egypt and other parts of the Roman Empire, as well as administrative records, have been underutilized thus far[15]. These have tremendous potential to yield information about plants, their spread throughout the ancient world, and the economics of the ancient plant trade.

The sources have well-documented limitations; the translation of ancient plant names both between ancient languages and into a modern tongue remains a key issue. In addition, the ancient sources frequently name but do not describe plants[16], making it difficult to identify these plants. This is further complicated by the fact that, until the 18th c. and Linnaeus' taxonomic classification, there was no systematic naming of plants[17].

[11] CAPPERS 2006, 3.
[12] or Spikenerd (*Nardostachys grandiflora* DC)
[13] CAPPERS 2006, 4–5; Table 1.1.
[14] *CIL* IV 5380; She identified leeks (*allium porrum* L.) and onions or cepa (*allium cepa L.)* on a bill in the *atrium* of a hotel at IX.vii.XXIV-XXV (JASHEMSKI *ET AL.* 2002, 87), Leeks originate in the Mediterranean or Near East; possibly dating from the second millennium BC in Egypt and Mesopotamia. They were an imported species at some point. This suggests movement of plants within the Mediterranean world – and possibly from the areas farther a field.
[15] Peacock *et al.*, for example, does not discuss cargo lists in their study of the ancient incense trade; it may be that there are no surviving records.
[16] JASHEMSKI *ET AL*. 2002, 83.
[17] The ancient citron, the so-called Median Apple, is a good example. The translation of "citron" brings a lemon or some type of orange to the modern mind; however, there is nothing in Pliny the Elder (*NH*, XII.vii.XV) that suggests a tie to what we think of as citrus fruits today. The citron, Median or Assyrian Apple is referred as "Malus Assyria, quam alii Medicam, vocant" by Pliny in this passage. The exact nature of this plant remains unclear.

Fig. 1 – The garden room at the villa at Prima Porta (JASHEMSKI 1992, n. 454, 381; courtesy of the estate of Wilhelmina Jashemski).

Scholars have turned to art historical remains, the second category of evidence, for both scientific knowledge and for the cultural significance of plants. The work has been most intensively conducted at Pompeii, where the depiction of plants in wall paintings, sculpture and mosaics has been studied since the 1850s[18]. However, significant evidence is also preserved in Rome and at sites around the Empire. The presence of art in garden paintings, for example, considered together with literary evidence, provides our current knowledge of the iconography of plants in gardens. Numismatic study also provides evidence of the political value and cultural meaning of plants, such as date palms and laurels, to those emperors or cities that selected them for the reverses of their coins[19]. Apart from the highly specific information that we derive from coins, arguably scholars may have been too simplistic with more complex forms of art as evidence for ancient plants[20]. We need to develop a discipline around ancient plant study that, like epigraphy, numismatics, and art, allows us to work within known limitations of the evidence and a knowledge of ancient practices. Wall paintings, sculpture[21] and mosaics, are inherently problematic, because they portray fictions grounded in ancient realities. The challenge for our discipline is to describe the parameters of our interpretation of the underlying reality, whose boundaries we have not as yet explored.

The garden room at Prima Porta is a depiction of a very particular kind of garden, filled with the most culturally significant plants of Republican Italy, and of Augustus' reign (fig. 1). Shown blooming simultaneously are plants that *actually* flowered at different seasons, in a kind of abundance not seen in the countryside itself[22]. It uses the medium of paint to compress time in a way that would not have been possible in life, despite the best efforts of horticulturists. Its plants and birds depicted with almost scientific accuracy, the Prima Porta painting, as far as we know, introduces this type of garden painting to Rome as a kind of do-

[18] JASHEMSKI *ET AL.* 2002, 80–1.

[19] MACAULAY-LEWIS 2008a, 205–55; KELLUM 1994; See BAUMANN 2002, for a study of plants on Greek coins.

[20] The study of Pompeii's plants is a good example of this. Scholars have often assumed that the plants shown were imported and grown in Pompeii (CIARALLO 2000, 7–9). While this is possible, it is noteworthy that much of the fauna – for example, crocodiles, tigers, lions - that were shown in Pompeian wall paintings most certainly did not have a physical presence in Pompeii. Day has highlighted some of the problems with studying art historical remains in Minoan Crete, see DAY 2006, 189–97.

[21] For treatments of plants and their meanings in sculpture, see CASTRIOTA 1995. His work focuses on the symbolism and significance of plants in Augustan ideology on the lower register of the *Ara Pacis*. Also see KELLUM 1994, for a study of the symbolism of plants in Augustan Rome.

[22] These plants are shown flowering for ideological purposes. For a discussion of the ideological implication of plants and gardens under Augustus and at Prima Porta, See GABRIEL 1995; KELLUM 1994; and REEDER 2001.

Fig. 2 – A nineteenth century watercolor of a wall painting depicting a *paradeisos* / garden scene with Orpheus from The House of Orpheus (VI.XIV.20), Pompeii (JASHEMSKI 1992, n. 399, 344; courtesy of the estate of Wilhelmina Jashemski).

Fig. 3 – Another nineteenth century watercolor of a wall painting depicting a *paradeisos* / garden scene with Orpheus from The House of Orpheus (VI.xiv.20), Pompeii. Note the differences from figure 2 (JASHEMSKI 1992, n. 400, 345; courtesy of the estate of Wilhelmina Jashemski).

cument of garden display. This accuracy of elements is seen in other forms of Augustan art, such as the Ara Pacis, but is this garden "real" in any sense? Most other types of landscape paintings give mere impressions of plant forms and types, such as villa scenes and sacral idyllic paintings.

That said, garden paintings at Pompeii seem to reflect a range of garden realities or fantasies from the totally impossible, such as the mythic landscape of Orpheus playing his lyre to the animals in the House of Orpheus (VI.xiv.20) at Pompeii (figs. 2-3), to the more plausible of the House of the Wedding of Alexander (VI.Insula occid.42), also at Pompeii (fig. 4), where plants known to the region flourished[23]. There does not appear to be a decline from the realistic to the impress-sionist at Pompeii; rather garden painting because of its flexible nature allowed the owner of each house or villa the ability to create a garden of his desire – a reality or fiction. These art historical sources are vital for understanding plants; however, because they are generally artistic repre-senttations – not botanical drawings – they must be used in conjunction with the other types of evidence to further our knowledge of ancient plants.

Finally, archaeological and archaeobotanical remains may have the most to offer scholars studying ancient plants because they provide evidence of the three dimensional environment in which the plants lived in an ecological setting, as well as in a cultural garden setting. In recent years, the archaeobotanical study of ancient food has flourished, demonstrating strong trade links with India via the Red Sea and Egypt and the wide transportation of food stuffs within the Roman Empire and beyond[24]. The trade of plants for food, incense, and other purposes demonstrates that plants moved throughout the empire and indicates that plants destined for display or other horticultural purposes probably occurred as well; however, because this has not been the focus of archaeobotanical studies thus far, a review of current archaeobotanical studies should provide additional insights into our understanding of Roman garden plants. Likewise, Garden Archaeology, a nascent area of study, is conti-

[23] Of course, there were often landscapes that lay between these two extremes. The so-called *paradeisos* landscapes may been "realistic" in the sense that they existed, but certainly they could never be present in the small lightwells and gardens of Pompeian houses. For example, see JASHEMSKI 1992, figs. 388; 391–5.
[24] See *supra*, nn. 4-5; CAPPERS 2006.

Fig. 4 – A garden painting from the House of the Wedding of Alexander (VI.Insula Occid. 42), Pompeii (n. 406, 348; courtesy of the estate of Wilhelmina Jashemski).

nually providing new evidence that enhances our picture of ancient gardens[25]. New studies of artifacts, from planting pots to iron tools, is casting new light on horticultural practices. Environmental evidence, or "ecofacts," illuminate the condition of the plant in its environment. This information is difficult to gain in other ways.

Ollae perforatae are of particular importance to trade, display, and garden design. Purpose-made planting pots were used as planters in Roman gardens, as were amphoras in a secondary reuse. Evidence for the plants housed in these pots, in the correct conditions – either in very dry climates – or in the volcanically sealed Vesuvian region, have survived. The remains exist either in the form of carbonized plant remains or as cavities that can be filled in to reveal the structure of the roots and the type of plant that was housed within. Even where the plant remains are not preserved, the pot's size gives some indication of the type of plant, and the location of the plant gives evidence for its place in the garden display. These planting pots may also provide information about the transportation and distribution of plants in the Roman world; according to the ancient sources[26], not only were these pots used as vessels to transport plants from nurseries to sites, but they were also used to transport plants throughout the empire. Thus, not only should the organic remains within the pots be useful in studying the movement of plants, but also the actual clay that composed these vessels may provide further insight into the ancient plant trade, across trade routes to local nurseries and markets[27]. Shipwrecks are another potential wealth of information for *ollae perforatae* and the ancient plant trade. Study of their remains may prove that planting pots or other vessels for plants

[25] GLEASON, LEONE 2011.
[26] MACAULAY-LEWIS 2006b, 207–9; Plin. *NH*, XII.vii.XVI, mentions the attempted and failed transportation of the Median Apple (*malus Assyria*).
[27] If the fabric of the vessels can be identified as having been imported, then this suggests that contents of the pots – at one point - were probably also imported.

were among the cargo. Furthermore, if *ollae perforatae* or other related material can be identified within the remains of several shipwrecks, it may be possible to identify more of the trade routes along which ancient plants moved.

In the area buried by Mount Vesuvius, root cavities are preserved. These form when the plant, buried in volcanic ash, decays and is filled with pumice or ash. The cavities are then filled with concrete, plaster, or from more modern materials like silicon or plastic[28]. These "casts" allow botantists to study the root structure and propose the species of plant present, if not allow a specific identification. In normal preservation conditions, only the pit in which the plant was originally placed is detectable, if a different soil was used to fill the pit after planting. Even this can be used as a general guide to the size and placement of the plant.

Archaeobotanical remains such as carbonized plants, seeds, phytoliths, pollen, and potentially, DNA analysis provide the most specific evidence for the study of ancient plants, display, and trade[29]. The full potential for this research for garden plants has barely been tapped; the study of foodways, referred to above, has already produced interesting results and demonstrated empire-wide trade and trade with India and Arabia[30]. Carbonized plants and seeds can be studied in order to identify what plants were actually present in a garden, although in most cases these are the plants in the fertilizer rather than garden. The finds of garden plants burned *in situ* at Pompeii[31], at the *Templum Pacis* in Rome; and as dessicated remains at sites such as Berenike in Egypt[32]; and in a variety of forms in Roman Britain[33] offer dramatic insights into plant and garden culture. Mineralization, waterlogging and charring can also preserve ancient plants[34]. Pollen and plant phytoliths can also be specific indicators under the right conditions. There are two types of pollen usually present: wind or insect borne. Plants pollinated by windborne pollen are more highly represented, and the plants could be anywhere in the greater region, not specifically the garden; insect pollinated plants need to produce less pollen and are not as likely to be represented in a pollen sample. Phytoliths, formed in the joints of plants where the local water is mineral rich, can survive for hundreds of years after the plant decays. These hypothetically represent a plant in situ. However, most Roman gardens were fertilized with kitchen debris, chaff, dung and other sources of plant phytolith. In the case of both pollen and phytoliths, finding garden plant remains can be like finding the needle in the haystack[35].

Faunal remains provide unexpected evidence of plants displayed in a garden and their state of maintenance. Many creatures are highly specific to their habitat. Molluscs, for example, are a promising, but nascent area of study. Each species is specific to a local habitat: open/sunny, wooded and shady, or low growing meadow. Certain molluscs appear only where specific trees were planted. Thus, they may indicate the types of plants present in a garden and could hint as to whether certain plants were imported. A survey of snails in the garden terrace at Prima Porta is but one of the early applications of this type of study[36].

This overview of the evidence suggests that the study of ancient plants and their trade is an interdisciplinary exercise, requiring the skills of historians, art historians, archaeologists, botanists, and other scientists to produce the most fruitful insights. Furthermore, this review suggests the need for a holistic, interdisciplinary approach to study the ancient plant trade, as well as the Roman attitude to plants, their desire to possess and display plants, their hybridization and horticultural manipulation of plants and how they went about doing this. Thus, we need a holistic approach that uses all of these types of evidence together.

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[28] For an application of studying root cavities outside of the Vevusian region, see GLEASON 1987-8, 21–39.
[29] See MILLER, GLEASON, 1994; *supra*, nn. 4-5.
[30] On the food trade of the Eastern Desert in Egypt, see CAPPERS 2006; On Egypt and Britain and food in the Roman world more generally, see VAN DER VEEN 2003a; 2003b; 2007; 2008; On food imports in Roman central Europe, see BAKELS, JACOMET 2003. On the incense trade, see PEACOCK, WILLIAMS 2007.
[31] JASHEMSKI *ET AL*. 2002, 82.
[32] CAPPERS, 2006, 49–138.
[33] VAN DER VEEN 2008, 83–109; esp. 102–104.
[34] CAPPERS 2006, 51.
[35] For the survival of pollen, waterlogged conditions are better than fertile soils, and drier conditions are better for the survival of pollen. Furthermore, pollen decomposes very quickly in "biologically active soils" (DIMBLEBY, GRÜGER 2002, 190).
[36] PINTO-GUILLAUME 2002, 37–58, is one of the few studies of this kind.

So in sum, does this approach work? Such a coordinated approach is producing superb evidence for gardens, and I believe it can be applied to the Roman plant trade.

Part II: The Roman Plant Trade

As noted above, *ollae perforatae* shed a particularly valuable light on the acquisition and use of plants as political symbols in the Roman world[37]. Study of the fabric of these pots thus far has demonstrated that these vessels were not used as interregional trade vessels, but were produced locally and used on a local or regional basis. For example, in the UK, pots, which were produced at a kiln in Eccles, Kent, and used at a local villa, have also been found in Southwark in London. While the distance between Eccles and London is only 47 kilometers, which is not considerable in modern times, this distance when seen in an ancient light hints a certain level of regional trade for plants from London's hinterland into its centre. This example suggests that garden plants were probably grown on farms or even in nurseries that produced plants for urban gardens among other agricultural products on a local and regional level[38]. However, local production of pots does not preclude the possibility that the plants were imported from outside the region. First, plants may have been traded in vessels that are "archaeologically invisible"[39]; baskets for transporting plants are mentioned along side *ollae perforatae* in the ancient sources[40]. Second, consider plant nurseries today. A comprehensive study of these pots together with evidence of ancient nurseries and horticultural practices should yield further insights into the trade of plants as saplings or cuttings[41].

Political symbolism may have also played a role in the selection of plants traded. One interesting example is balsam (*Commiphora gileadensis* L. or *C. opobalsamum* L.). While its resin, like that of frankincense and myrrh[42], was highly coveted throughout the ancient world, the plant could not be traded as such and the balsam, while grown successfully in Roman Italy, according to Pliny the Elder, never had its original potency[43]. Like other incense plants from the Levant and Arabia[44], balsam only grows under specific, controlled conditions to produce the very high quality of resin sold and traded throughout the Roman world[45]. Also grown in the same region were a wide variety of date palms, highly valued in trade, and eventually symbolizing on coinage the conquered Jews after the suppression of the Jewish Revolt[46]. These brief examples highlight how plants were transported and traded in different forms – probably as saplings, whole plants, cuttings, and certainly as seeds and processed by-products[47]. By looking at all the types of evidence, we see that it cumulatively suggests longer distance trade than the *ollae perfortae* evidence alone does.

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37 MACAULAY 2007, 191–5; 783–91; MACAULAY-LEWIS 2006a, 159–70; MACAULAY-LEWIS 2006b, 207–20.

38 Cf. to horticultural production in Rome's hinterland, see WILSON 2008, 731–68.

39 DE SENA 2005, 1, on the concept of "archaeologically invisible" vessels for oil and wine production in the hinterland of Rome.

40 Cato, *De Agricultura,* LII.

41 For example, figs were propagated by cutting (CAPPERS 2006, 87). Reportedly, they were also easy to transport.

42 The balsam tree belongs to the *Burseraceae* family of incense trees; two of the genera in this family produce frankincense and myrrh respectively (CAPPERS 2006, 81).

43 Plin. *HN* XII.CXI.

44 SINGER 2007, 4–28. Queen Hatshepsut of Egypt unsuccessfully tried to transplant "living incense trees" from Punt, possibly northern Somalia, to Egypt to guarantee a permanent supply of resin for religious purposes. However, this attempt failed because Egypt did not have the specific conditions required to cultivate frankincense or myrrh trees. See SINGER 2007, 4–6. Pliny also reports that many countries unsuccessfully tried to transport the citron in *ollae perforatae*; he does report that the kings of Sardis had transplanted Frankincense successfully, *NH*, XII.vii.XV–XVI. However, it seems highly likely that the Frankincense tree would not have survived at Sardis for long, as Sardis lacks the proper climate for Frankincense. This suggests that Pliny is misinformed here.

45 Cf. CAPPERS 2006, 80–82.

46 Planting pots were also found in Judaea, showing the wides-pread nature of these vessels in the Roman world and its neighbours, See GLEASON 1987/8, 21–39.

47 In Berenike and Shenshef in Egypt, see CAPPERS 2006, 49–138; on the methods of food storage and transport, see 144–151. From the archaeobotanic evidence at Berenike, it is clear that food, prepared or otherwise, was transported in many forms, from dried fruit to feeds to pickling.

From the many classes of evidence, it is possible to sketch an outline and possibly a reasonable picture of the ancient plant trade and its complex, multifaceted nature when using an interdisciplinary approach. This evidence, although limited at present, has huge potential for future studies to break down the complex phenomenon, of local, regional and interregional trade within the Empire. The study engages with other emerging research on the local, regional and empire-wide patterns of trade in the Roman world. The increasingly well-documented evidence for a widespread spice and food trade in the Roman world suggests that trade for exotic garden plants probably did occur and that this trade can be identified in the archaeological record. Likewise, new assessments of eastern trade networks, as well as documentation of amphorae types and movement, generally, throughout the world known to the Romans is helping to set the context for this study of plants. The papers in the recent volume, *Food for the Gods*, drew upon archaeological, geological, and literary evidence to study the ancient incense trade[48]. These various studies demonstrated that long distance trade between pre-Roman and Roman Egypt, Arabia and India was established in the late first century BC and continued to thrive until the end of the Roman Empire. Petra, famed for its tombs, also seems to have been another point where traces of the plant trade and the exchange of ideas about gardens is evident[49]. Likewise, in her final study of Pompeian plants in her *Natural History of Pompeii*, Jashemski used ancient source material, graffiti, art historical evidence and archaeobotanic remains to catalogue all the plants that she could identify. Her study, which identified numerous foreign species at Pompeii[50], demonstrates that imported plants, vegetative *exotica*, were not the exception as Pliny the Elder and other ancient authors might like us to think. From the plane (*Platanus orientalis L.*) to an apple (*Malus* sp.), the Roman world was awash with imported plants – luxurious or not.

Conclusions

In sum, these disparate studies mark the beginning of the study of ancient plants and their trade. We have hints of a complex, multi-layered system whereby different plants were traded throughout the Roman world and beyond as garden plants, incense, medicinal remedies, and symbols of social status. The Romans were not victims of some vast foreign plot to overrun the empire with non-native flora, rather they actively sought and imported plants, such as balsam even if they did not flourish. Pompey the Great and later Vespasian and Titus displayed foreign plants as part of their triumphs, further suggesting that plants were highly in demand for many different purposes in the Roman world[51]. To try to understand this Roman desire for foreign plants and the complex trade it spawned is best understood through an interdisciplinary approach, as suggested in this paper.

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Elizabeth Macaulay-Lewis
Oxford University, UK
E-mail: Elizabeth.Macaulay@wolfson.ox.ac.uk; Lizzie.Lewis@mac.com

[48] GUPTA 2007, 112–21; PEACOCK *ET AL.* 2007, 28–70; PEACOCK, BLUE 2007, 135–40; SINGER 2007, 4–27; SEDOV 2007, 71–111.
[49] MACAULAY-LEWIS 2006a, 159–70; BEDAL 2004.
[50] JASHEMSKI *ET AL.* 2002, 101–74.
[51] MACAULAY-LEWIS 2008, 205–25.

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Shipwrecked Plant Remains

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Shipwrecked Plant Remains

by Cheryl Ward Haldane

A diver removes one of the more than 100 Canaanite amphoras carried in the hold of the Bronze Age ship lost near Ulu Burun, Turkey. By studying the shreds and scraps of plant tissues attached to artifacts, archaeobotanists can often learn what the pieces contained. Unless otherwise noted, all photographs are by Donald A. Frey of the Institute of Nautical Archaeology.

By studying shreds and scraps of plant tissues from archaeological investigations, archaeobotanists learn how people used plants in the past. Such remains are usually waterlogged or desiccated by their environment, or are charred by cooking or burning. Although late-nineteenth-century excavations in Egypt and Scandinavia produced sensational finds of ancient plant remains, archaeobotany's greatest growth came in the 1960s when excavators like Robert Braidwood sought to learn when animals and plants were domesticated in the Near East. Archaeobotanists followed the pioneering example of Hans Helbaek and began to study plant remains to learn about ancient peoples and how they used the world around them.

The introduction of flotation processes to separate charred organic material from dirt was a revolutionary step in archaeobotany. The larger, more varied samples obtained by flotation allow more exact comparisons with modern and ancient ecological and economic systems, ways of manipulating plant products, and patterns of resource exploitation.

In the Near East, charred seeds are the most common plant remains. Agricultural crops such as wheat, barley, peas, lentils, beans, and flax are often present on land sites. On the other hand, only three charred grains have been identified in more

Left: *Douglas Haldane (left) and Michael Halpern store ceramic containers in a water-filled basin in the excavation camp at Ulu Burun.* ***Right:*** *Claire Peachey and Michael Halpern of the Ulu Burun excavation staff remove sediment from a Canaanite amphora (shipping jar) while, in the foreground, Nicolle Hirschfeld sifts the sediment for organic remains.*

than 600 samples from 10 eastern Mediterranean shipwrecks, although a single sample from a Byzantine wreck yielded more than 600 grape seeds. Shipwreck archaeobotany produces abundant remains of fruits, nuts, and spices seldom found on land sites.

Shipwreck Archaeobotany

In the Mediterranean, shipwrecks usually appear as low mounds of shipping jars (amphoras) on the seabed. Waterlogged and charred plant seeds, twigs, leaves, fruits, wood, and other plant tissues, as well as animal and fish bones, insects, dung, and hairs can be found in samples taken from the site, even if the wreck is exposed.

During the first 15 years of scientific exploration, beginning in the 1950s, serendipitous finds of fruit stones and nuts from many Mediterranean shipwrecks suggested the variety of wares transported by sea and the potential value of archaeobotanical analysis of such remains. It was not until the 1970s, however, that archaeologists attempted to systematically retrieve plant tissues that were not part of the hulls of ships. Between 1974 and 1980, the Institute of Nautical Archaeology (INA) sponsored four excavations in which archaeobotanical investigation was standard procedure. In each case, the organic samples proved that the shipping jars had carried wine, but traces of previous cargoes and other materials aboard the ship provided us with additional information about the production and exchange of goods.

In 1984, INA began excavation of the Late Bronze Age shipwreck at Ulu Burun, Turkey. George F. Bass, director of the excavation, enthusi-

All but two of the plants identified so far from the Ulu Burun shipwreck are among the relatively few mentioned in the Bible.

astically supported the idea of retrieving every possible bit of organic material from the wreck for study. The dedication of the excavation team resulted in a unique assemblage of plant remains that offers a glimpse into a little-known aspect of ancient life. It is interesting to note that all but two of the plants identified so far are among the relatively few plants named in the Bible, where scarcely more than 100 of the 2,300 plant species found in biblical lands are mentioned (*Interpreter's Dictionary of the Bible* 1962: 285).

The ship's cargo mirrored records of royal tribute exchanged by Late Bronze Age Egyptian and Near Eastern rulers and included the most luxurious and expensive items of the time: copper, tin, and glass ingots; gold and silver jewelry; unworked elephant and hippopotamus ivory; Egyptian ebony logs (*Dalbergia melanoxylon*); and several small and large stirrup jars that archaeologists believe carried perfume (Bass 1986; Pulak 1988).

As excavators raised more than 100 Canaanite shipping jars, we learned that the ship had also carried about half a ton of terebinth resin from *Pistacia terebinthus*, identified by John Mills of the National Gallery of London and the Hairfields of Mary Baldwin College (Hairfield and Hairfield 1990). The chunks of resin retain their sharp, pungent, turpentine-like odor today. Although the terebinth, or turpentine tree, is mentioned in the Bible (Isaiah 6:13; Hosea 4:13, Revised Standard Version) and other ancient texts, this huge quantity of resin was puzzling at first. But Mycenaean Greek Linear B tablets, Egyptian texts, Classical Greek writings, and modern ethnographic evidence provided the clues we needed to understand why the resin was included with the exotic and valuable goods carried on the ship.

A group of Linear B clay tablets, dating to the end of the Bronze Age, lists the names of plants possibly used in perfumery, cooking, and medicine. Among these names is *ki-ta-no*, translated by Jose Melena (1976: 180) as terebinth nuts. The word occurs rarely, and the Ulu Burun cargo suggests that terebinth resin, rather than its edible nuts, may have been the intended meaning (Bass 1987).

We know from several classical authors that terebinth resin was highly valued. According to Theophrastus (*Enquiry into Plants* 9.2.2; see Hort 1916: 223), "There are also differences in the resin obtained from different trees. The best is that of the terebinth, for it sets firm, is the most fragrant, and has the most delicate smell; but the yield is not abundant." Dioscorides (*De Materia Medica* I.71.1–6; see Wellmann 1958: 67–70) describes the preparation of terebinth resin for "good smelling" emollients and perfumed oils and notes that, when boiled, terebinth resin was also valued for coloring perfumed oils. Pliny (*Natural History* 13.2.7–8; see Rackham 1945: 103) notes that terebinth resin was used in perfumes and acted as an astringent to retain scent.

Theophrastus also provides us with a possible source for the resin: ". . . Around Syrian Damascus it [the terebinth tree] is abundant, large and beautiful; for they say there is a mountain all full of terebinths, but nothing else grows there." Modern residents of Syria and Turkey collect the resin and prepare it for sale in bazaars and perfumer's shops (Whitehouse 1957). Although terebinth grows elsewhere around the Mediterranean, only in its eastern areas do winter temperatures drop low enough to cause the tree to produce resin.

If not for perfume manufacturing, the resin lost at Ulu Burun may have been intended to be used as incense. Victor Loret interpreted the Egyptian word *sntr* as terebinth resin. If he is correct, Egyptian texts refer to thousands of liters of the resin being imported each year to Egypt from the Syro-Palestinian coast to be burned in ritual fumigation (Loret 1949).

Like the terebinth resin, fruits of *Coriandrum sativum* (coriander) are found on the Ulu Burun wreck and mentioned in Mycenaean Greek Linear B tablets. The distribution of coriander seeds in shipping jars, dunnage samples, and samples from beneath ingots suggests that the seeds were stored in baskets or woven bags which scattered their contents as they decayed. Linear B documents describe up to 720 liters of coriander seed mixed with wine, honey, and other spices in perfumery, and used in smaller amounts as a condiment (Ventris and Chadwick 1956: 221–30). According to Cynthia Shelmerdine (1985), coriander fruits were used to prepare the astringent solution necessary to hold the scent of a perfume with an olive oil base. Melena (1974: 155) has pointed out that coriander fruits were also offered to a local Mycenaean deity. Coriander was regarded by the Mycenaeans as being of Cyprian origin (Ventris and Chadwick 1956: 221), but Melena (1974) has suggested that it was grown on Crete. It is mentioned only twice in the Bible (Exodus 16:31; Numbers 11:7), in both instances simply to compare the appearance of manna to

Until medieval times, sailing was limited to the months between April and early September because of storms.

Above: *Even weed seeds provide vital clues to ancient trading activities. This assortment of seeds from the Ulu Burun shipwreck includes safflower, caper, and wildflower seeds. Other seeds mentioned in the Linear B texts, dating to the end of the Bronze Age, and found at various underwater sites include grape seeds and fig seeds. Photograph by Cheryl Haldane.* ***Right****: Still preserved after more than 3,300 years on the lower side of a copper ingot is the thorny burnet (*Sarcopoterium spinosum*) that formed a protective cushion, called dunnage, for the heavy cargo. This bush, which grows in abundance in the Mediterranean, is best known for its possible use in the thorny wreath worn by Jesus.*

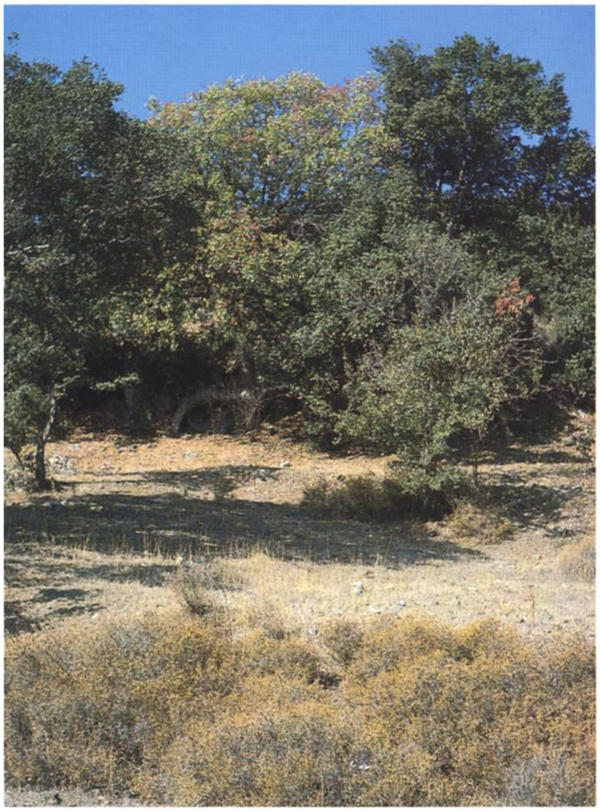
its seed. The value placed on coriander by other ancient societies can be seen in the half-liter of seeds that accompanied the pharaoh Tutankhamun in his golden tomb (Darby, Ghalioungui, and Grivetti 1977: 798).

A third possible source of astringent for ancient perfume manufacture—pomegranate juice—may be seen in the contents of one of seven large storage jars (*pithoi*) from the Ulu Burun shipwreck. A preliminary sorting of a sample from this 1.4-meter-tall (about 4½ feet) pithos produced more than 1,000 seeds, flower parts, and fragments of skin from what were once whole pomegranates.

Pomegranates were so valued in antiquity that they were presented as evidence, along with figs and grapes, when the spies sent to Canaan by Moses reported: "We came to the land to which you sent us; it flows with milk and honey, and this is its fruit" (Numbers 13:27). Images of the pomegranate used to decorate clothing (Exodus 28:33–34, 39:24–25) and the capitals of the pillars (I Kings 7:18, 20, 42, and others) are further indication of the prominence of this fruit, whose juice was used in a spiced wine (Song of Solomon 8:2).

Although no Linear B word has been translated as pomegranate, the classical writers often refer to its astringent qualities in perfumery and medicine, and to its use as a flavoring for wines as well as its use as an edible fruit and a natural dye.

Pomegranates ripen in late August or September, suggesting that the ship may have sailed late in the season. Until medieval times, sailing in the Mediterranean was restricted to the months between late April and early September because of storms. Although it seems likely that the pomegranates aboard the Ulu Burun ship were fresh, it is possible that the fruits were from the previous autumn. Columella (*Lucius Junius Moderatus Columella*



The Mediterranean coastal region plays host to a wide variety of plants. Low mounds of thorny burnet can be seen before a terebinth tree (Pistacia terebinthus*), which has bright red fruits. Instead of being used as dunnage aboard ships, here thorny burnet is used to enclose animals within low-fenced fields. The fruits (nuts) of the terebinth tree are eaten throughout biblical lands, and its resin is still sold in bazaars—although no longer in Canaanite amphoras. Photograph by Cheryl Haldane.*

on Agriculture 5.10.16; see Forster and Heffner 1954: 97) provides instructions for preserving whole pomegranates for more than a year, and modern Turkish villagers store pomegranates year-round using similar methods.

Pomegranates are rarely found in Bronze Age archaeological deposits on land, but there are two charred seeds in samples from the early third millennium B.C.E. at Arad (Hopf 1978: 74); seeds and skin fragments from Bronze Age Jericho (Kenyon 1960: 371, 392–393, and plate XVII.4; Hopf 1969: 357) and Twelfth Dynasty Egypt (Darby, Ghalioungui, and Grivetti 1977: 742); waterlogged seeds at Hala Sultan Tekke on Cyprus about 1200 B.C.E. (Hjelmqvist 1979: 112); and in many finds from the seventh century B.C.E. onward.

Pomegranate trees are mentioned in the funerary texts of Tuthmosis I (around 1530 B.C.E.) and appear in tomb paintings of approximately 100 years later. The tomb of Sebkhotep shows two men carrying pomegranates (Davies 1936: plate XLIV): One carries a basket, the other a string of fruits tied together. A painting from the Late Bronze Age tomb of Menna shows two women, one of whom carries a bouquet that includes crimson pomegranate fruits (Davies 1936: plate LII). Sir Arthur J. Evans described ivory pomegranate buds and flowers from the Middle Minoan III period at the palace of Minos on Knossos (1921: 496).

The Ulu Burun shipwreck also yielded a few safflower (*Carthamus tinctoria*) seeds, several thousand fig seeds, an amphora full of olive stones, and two charred cereal grains: one wheat and one barley. Linear B texts also record these commodities, and all but safflower are mentioned frequently in the Bible. Several shells of almonds, also mentioned many times in the Bible, sumac (*Rhus coriaria*) fruits, and grape seeds complete the roster of economic plants; about 15 weed species are also represented.

A puzzling discovery from other shipwrecks are the seeds, leaves and fruits of thorny burnet (*Sarcopoterium spinosum*), a spiny, knee-high bush best known for its possible use in the thorny wreath of Jesus. The most reasonable suggestion is that it might have been used as dunnage to create a protective cushion between the hull and its load. The Ulu Burun wreck has strengthened this hypothesis: In addition to providing more samples of seeds, entire plants, from branches to roots, were found on the lower surfaces of some of the approximately 200 four-handled copper ingots in the cargo.

Although the evaluation of samples from Ulu Burun is incomplete, some statistical analyses of about half the samples suggest some patterns in the distribution of plant remains. Of some 20 samples of charcoal, most are from scrubby trees of the family *Leguminosae* that line the shores of the eastern Mediterranean. The distribution of charred wood on the wreck seems to be fairly limited in area and may indicate a shipboard brazier or hearth. Charred seeds are strictly unrelated to the charcoal samples but can be correlated to the presence of an organic conglomerate of terebinth fruits, chips of resin, twigs, leaves, and mud. This conglomerate, found in about one-third of the shipping jars, may be the remains of a previous terebinth resin or fruit cargo. It is also possible that it represents imploded mud stoppers or caps (Pulak 1988). Interestingly, grape seeds found in the conglomerate are of a strikingly different shape from those found lying loosely in the ship's bilge area. Because grape seed shape varies with the type of grape grown, these two categories probably have different origins.

As more samples from the Ulu Burun shipwreck are analyzed, the number of plant species found on this ship that once sailed along the Eastern Mediterranean coastline will grow. Simply identifying the species represented is not enough, however, and will serve only to tantalize students of ancient trade in the Mediterranean.

Studying other plant remains in

jars that carried the resin may help archaeologists locate the port where the aromatic was loaded as well as learn about how jars were sealed and whether they were reused. Bass suspects that the ship traveled a circular route from the Syro-Palestinian coast to Cyprus and Mycenaean Greece or Crete before returning to the Levant via Egypt (1986: 296). If so, its cargoes of terebinth resin, coriander, and pomegranates may be added to the list of luxury items that indicate an established exchange network with markets demanding large-scale availability.

Conclusion

Underwater archaeobotany provides direct evidence of goods traded by sea and often produces botanical remains of plants unlike those found in charred deposits on land. The Ulu Burun shipwreck samples provide the largest Bronze Age collection of pomegranate, fig, olive, and terebinth remains, and the leaves and twigs in dunnage samples are unique representatives of Bronze Age flora used in this way. Ships, the people who sailed them, and the goods they took from port to port in the ancient Mediterranean were vital links between cultures. By studying organic as well as inorganic remains, we enrich our knowledge of humankind's past.

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The Flowerpots from Herod's Winter Garden at Jericho*

JOSEPH YELLIN and JAN GUNNEWEG

The Hebrew University of Jerusalem

KING Herod (37–4 B.C.E.) continued the tradition established by the Hasmonaeans and built a winter palace at Jericho. It was built in three stages, the third one (built around 15–10 B.C.E.) being the most elaborate. This study is based on the results of the excavations of the palace conducted by E. Netzer.[1]

Dozens of vessels interpreted as 'flowerpots' were found during the excavations at Jericho; the majority of these are from various parts of Herod's 'third palace', mentioned above. The pots were found in the sunken gardens inside peristyled courtyards in the northern wing and elsewhere, and were used as containers in which were planted either shrubs or plants. These flowerpots closely resemble inverted ceramic bottles without bases (Pl. 11:B). They are characterized by a central hole in the bottom. and two or three additional holes in the sides, through which the roots of the plants could penetrate into the surrounding earth in which the pots were set. Such flowerpots, as far as we know, have not yet been found elsewhere in Herod's kingdom but parallels are known, mainly from contemporary Pompeii.[2] The source of these pots is of great interest, since they are chronologically and geographically restricted, and hence may help to illuminate the cultural and trade relations of a most interesting historical period.

The flowerpots from Herod's winter palace garden are not of particularly fine workmanship, and it seems unlikely that they would have been imported from distant lands. Their local rarity, however, and the parallels from Greece and Italy suggest that there was something special about these pots. Our first object was to try to

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* We wish to thank the staff of the Soreq Nuclear Research Centre for carrying out the neutron irradiations, and S. Riss for the benefit of his expertise with the instrumentation. We thank E. Netzer for calling the problem to our attention, and for much useful advice.

1 E. Netzer: The Hasmonaean and Herodian Winter Palaces at Jericho, *IEJ* 25 (1975), pp. 89–100; idem, The Hasmonaean and Herodian Winter Palaces at Jericho, *Qadmoniot*, VII (1974), pp. 27–36 (Hebrew); idem, The Winter Palaces of the Judaean Kings at the End of the Second Temple Period, *BASOR* 228 (1977), pp. 1–15; see also J.B. Pritchard: The Excavation at Herodian Jericho, 1951, *AASOR* 32-33 (1958), pp. 1–58; J.L. Kelso and D.C. Baramki: The Excavation of New Testament Jericho, *AASOR* 29–30 (1955), pp. 1–49, esp. p. 17 (flowerpot finds); Kathryn L. Gleason: Garden Excavations at the Herodian Winter Palace in Jericho, *Bulletin of the Anglo-Israel Archaeological Society* 7 (1987–88), pp. 21–39.

2 Wilhelmina F. Jashemski: The Discovery of a Market-Garden Orchard at Pompeii, *AJA* 78 (1974), pp. 391–404, esp. p. 399; Pl. 81, Fig. 9; Pl. 82, Fig. 8.

determine whether they were locally made. Here we relied on the fact that a kiln containing pottery was reported by the excavators of Herod's palace.[3] We presume that the pottery found in the kiln was made from local clay, and that its composition can be taken as a reference point for locally-made pottery. In addition, we used ceramics from the Judaean hills for a regional reference.

Four cooking pots and two jugs from the kiln (Pl. 11:C) were sampled for instrumental neutron activation analysis (INAA). In addition, four coarse bowls, considered to be local on stylistic grounds, were analysed, and five more bowls (from Jericho) previously analysed in connection with another problem were examined.[4] The latter were judged to have come from the Judaean hills on the basis of their chemical composition and spatial distribution. Two flowerpots which were indistinguishable from the others available for sampling were analysed. All of the pots investigated are of the same date. The 16 samples of material, the locus where each was found, their registration numbers and descriptions are given in Table 1, along with the laboratory numbers (in the first column), which will be used for easy reference. The TERRA samples are those previously examined (TERRA 26, 28, 29 and 44), whereas those pots specifically sampled in connection with our research on flowerpots are coded JER.

Table 1: Details of the samples analysed.

Sample	Locus	Reg. No.	Description*
JER 100	F 128	3552/1	Jug with omphalos base (kiln)
JER 101	F 128	3572/1	Jar
JER 102	F 128	3549/1	Jar
JER 103	F 128	—	Cooking pot (kiln)
JER 104	F 128	—	Cooking pot (kiln)
JER 105	F 128	3550/1	Jar (kiln)
JER 106	F 128	3551/1	Cooking pot (kiln)
JER 107	F 128	3553/1	Cooking pot (kiln)
JER 108	A 2	747/4	Flowerpot
JER 109	A 2	126/1	Flowerpot
JER 110	—	—	Handle
TERRA 26	B 154	399/9	Bowl, buff with flat inverted rim
TERRA 28	B 154	399/7	Bowl, red ware, string-cut base, inverted rim
TERRA 29	B 154	399/4	Bowl, red ware, string-cut base, round inverted rim
TERRA 44	B 154	399/0	Bowl, light brown ware, string-cut base

* *All JER* samples are of the Herodian period.

[3] E. Netzer, personal communication.

[4] J. Gunneweg, I. Perlman and J. Yellin: *The Provenience, Typology and Chronology of Eastern Terra Sigilata* (*Qedem* 17), Jerusalem, 1983.

ANALYTICAL RESULTS AND CONCLUSIONS

The method of INAA has been adequately described previously and will not be discussed here.[5] INAA has been successfully employed as an accurate means of chemically 'finger-printing' pottery.[6]

The results of the analysis of the flowerpots and the four TERRA coarse flat bowls are given in Table 2. Column 1 gives the mean value and root-mean-square deviation for each element of the four TERRA bowls, and Columns 2 and 3 present the composition of the two flowerpots. Even without extensive statistical analysis, it is evident that the flowerpots match the coarse TERRA bowls' composition. Since the TERRA samples have been shown to come from the Judaean hills, we may conclude that the flowerpots were not imported from distant lands, but rather come from the region of Jericho. In Tables 2–4 we have listed values for 13 elements. A number of other element concentrations measured were not used for diagnostic purposes, owing to relatively large measuring errors; we used only those elements for which the measuring errors are considerably less than the dispersion usually encountered in pottery.

Table 2: Analysis of the flowerpots and four TERRA bowls.

Element[1]	TERRA[2] (4 pieces) $M \pm \sigma$	JER 108	JER 109	Mean (108, 109) (2 pieces) $M \pm \sigma$
Ce	71.6 ± 4.0	73.8	70.2	72.0 ± 2.5
Co	13.94 ± 1.72	16.48	16.21	16.34 ± 0.19
Cr	172 ± 4	137.8	153.7	146 ± 11
Eu	1.66 ± 0.09	1.651	1.539	160 ± 0.08
Fe (%)	4.47 ± 0.25	5.23	4.89	5.06 ± 0.24
La	35.36 ± 1.95	35.74	36.14	35.94 ± 0.28
Lu	0.482 ± 0.015	0.461	0.563	0.512 ± 0.072
Nd	31.5 ± 1.6	31.05	31.79	31.4 ± 0.5
Sc	15.62 ± 0.67	16.52	16.44	16.48 ± 0.06
Sm	6.50 ± 0.34	6.49	7.25	6.87 ± 0.53
Ta	1.361 ± 0.057	1.496	1.428	1.46 ± 0.05
Th	8.04 ± 0.38	8.53	7.81	8.17 ± 0.51
Yb	3.20 ± 0.19	3.15	3.10	3.12 ± 0.04
	1	2	3	4

[1] Values are in parts per million except where otherwise noted.

[2] TERRA 26, TERRA 28, TERRA 29, TERRA 44.

[5] See I. Perlman and F. Asaro: Pottery Analysis by Neutron Activation, *Archaeometry* 11 (1969), pp. 21–52.

[6] A.L. Wilson: Elemental Analysis of Pottery in the Study of its Provenance: A Review, *Journal of Archaeological Science* 5 (1978), pp. 219–236.

Table 3: Comparison of the composition of flowerpots (Group 1) and cooking pots (Group 2).

Element[1]	Group 1 (3 pieces) M ± σ	Group 2 (4 pieces) M ± σ	Group 3 (7 pieces) M ± σ	σ (G12 by percentage
Ce	75.3 ± 6.0	97.5 ± 2.4	81.1 ± 6.9	(8.5)
Co	16.26 ± .20	22.42 ± 1.0	18.94 ± 3.44	(18.1)
Cr	156 ± 20	152 ± 21	139 ± 23	(16.5)
Eu	1.646 ± 0.105	1.823 ± 0.100	1.618 ± 0.090	(5.6)
Fe (%)	4.94 ± 0.26	5.12 ± 0.24	4.63 ± 0.36	(7.8)
La	35.7 ± 0.4	38.7 ± 1.4	34.3 ± 1.6	(4.7)
Lu	0.532 ± 0.062	0.669 ± 0.021	0.560 ± 0.046	(8.2)
Nd	32.2 ± 1.3	39.5 ± 1.6	33.2 ± 1.6	(4.8)
Sc	16.22 ± 0.45	16.32 ± 0.78	14.98 ± 1.25	(8.4)
Sm	6.99 ± 0.43	7.65 ± 0.27	6.79 ± 0.34	(5.0)
Ta	1.486 ± 0.054	1.783 ± 0.012	1.517 ± 0.043	(2.8)
Th	8.25 ± 0.38	11.70 ± 0.38	9.23 ± 0.98	(10.6)
Yb	3.23 ± 0.19	4.24 ± 0.21	3.48 ± 0.28	(8.1)
	1	2	3	4

[1] Values are in parts per million except where otherwise noted.
Group 1 = JER 102, 108, 109 (a jar and two flowerpots).
Group 2 = JER 103, 104, 106, 107 (cooking pots from the kiln).
Group 3 = a composite of Gl and G2, with G2 adjusted for dilution.

Table 3, Column 1 gives the composition of a group of three pots, JER 102, JER 108, and JER 109 (Group Gl). The latter two are the flowerpots. In Column 2 is shown the composition of a group of four cooking pots, JER 103, JER 104, JER 106 and JER 107 (Group G2). All four of these were found in a kiln (personal communication from E. Netzer) and are thus presumed to be of local manufacture. At first glance, the two groups appear dissimilar, which could lead to the conclusion that the flowerpots were not made in Jericho. However, close inspection shows that the difference between the two groups is not inconsistent with dilution of the same clay. In Column 3 (Group G12) is shown the mean composition of all seven pots, after adjustment for dilution. The adjustment consisted of uniformly reducing the concentration of the trace elements of Group G2 by 14% relative to the composition of Group Gl (another way of looking at it is that if we were to take the clay of which Group Gl is made and add to it a quantity of sand or calcium carbonate equal in weight to 14% of the clay, we would obtain the composition of Group G2). It is clear that the concentration of cobalt (Co) in the cooking pot JER 107 is about 39% higher than in the other cooking pots, and that this is responsible for the high dispersion in cobalt. If JER 107 is excluded from the group, the dispersion in cobalt is reduced by a factor of 2, without significantly affecting the dispersion in the other elements. We

have no explanation for this, but surely JER 107 cannot represent a different clay when cobalt is the only element whose concentration differs significantly from that of the other cooking pots.

Along with the cooking pots recovered from the kiln were two jugs. The composition of these (JER 100, 105) and the jar (JER 101) is given in Column 1 of Table 4 (Group G3); Column 2 shows Group G12 for contrast. The jar JER 101 was adjusted for dilution. It is evident that the two groups are of different composition and that the differences cannot be reconciled by dilution effects. It is not surprising that the coarse wares (cooking pots, flowerpots and TERRA bowls) have a different composition from the finer wares (jugs and jar). Either different clays were used for coarse wares and fine wares, or the clay was treated in some manner; perhaps something was added to make the coarse wares more resilient to heat, or a fraction of the clay was removed to bring out the qualities of the finer wares.

One of the ceramic samples analysed, the handle JER 110, has a composition unlike any other yet encountered. This sample is characterized by high thorium (18 ppm), high chromium (232 ppm), high cerium (108 ppm) and high rubidium and caesium, respectively 143 and 9 ppm. This piece, judging from its composition, did not come from the Jericho region.

Table 4: Comparison of the composition of a group of finer wares (Group 3) and a group of coarser wares (Group 12).

	Group 3 (3 pieces)		Group 12 (7 pieces)	
Element[1]	M ± σ	σ%	M ± σ	σ%
Ce	55.7 ± 1.0	(1.7)	79.7 ± 6.2	(7.8)
Co	18.1 ± 3.0	(16.8)	18.9 ± 3.4	(18.0)
Cr	122 ± 9	(7.7)	144 ± 22	(15.3)
Eu	1.263 ± 0.033	(2.7)	1.609 ± 0.095	(5.9)
Fe (%)	3.88 ± 0.14	(3.7)	4.68 ± 0.36	(7.7)
La	26.50 ± 0.75	(2.8)	34.5 ± 1.5	(4.3)
Lu	0.390 ± 0.009	(2.3)	0.560 ± 0.046	(8.2)
Nd	24.58 ± 0.67	(2.7)	33.2 ± 1.7	(5.1)
Sc	17.61 ± 0.74	(4.2)	15.1 ± 1.3	(8.6)
Sm	5.20 ± 0.15	(2.9)	6.79 ± 0.38	(5.6)
Ta	0.81 ± 0.09	(11.4)	1.512 ± 0.044	(2.9)
Th	7.93 ± 0.99	(12.5)	9.1 ± 1.0	(11.0)
Yb	2.54 ± 0.04	(1.5)	3.42 ± 0.27	(7.9)
	1		2	

[1] All values are in parts per million except where otherwise noted.

Group 3 = JER 100, 101, 105; JER 100, 105 are jugs from the kiln. JER 105 has been adjusted for dilution.
Group 12 = JER 102, 103, 104, 106, 107, 108, 109.

DISCUSSION

The scarcity and uniqueness of the 'flowerpots' led us to investigate their origin. Were these pots imported specifically for Herod's winter palace garden? Was a craftsman brought in to make them, or did a local craftsman copy the style of the pots? The evidence from INAA is that the pots were made in the vicinity of Jericho, if not in Jericho itself. It seems that the flowerpots were made especially for Herod's winter palace at Jericho. In the absence of evidence for the existence of such pots elsewhere in Herod's kingdom, this is the only reasonable conclusion. It is baffling, however, why once these pots were introduced they did not find wider use. Perhaps future archaeological finds will throw light on these questions.

PLATE 11

A: The inscription on the altar.

EVIDENCE OF THE CULT OF ZEUS AKRAIOS

B: Flowerpots found at Jericho.

C: The kiln at Jericho.

FLOWERPOTS FROM HEROD'S GARDEN AT JERICHO

Landscape Design and the Experience of Motion

edited by Michel Conan

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Delight and Danger in the Roman Water Garden: Sperlonga and Tivoli

Ann Kuttner

The Romans would have called the theme of this volume *motus* or *motio*. Importantly for gardens, they used these words interchangeably for *desire* and *thought*—Cicero's two essential *motiones* of the soul.[1] Here *emotion* and *motive* still associate feeling with moving and being moved. Landscape design patterns exterior and natural space for motion, on which are then imposed conscious significance by memory and expectation. *Itinerary* echoes the Roman *itinerarium*: any sequential journey of significant pattern for meaningful ends. Aptly, the stylized rural and leisured life of *otium* in which gardens were used was named as deliberated motion, *secessus* (withdrawal), as were garden corners (*recessus*). Complex Roman spaces highlighted itinerary as the premise of design armature and its sensed aim. Even small rooms and gardens exploited social ritual and decoration to propound itinerary. Viewers were led in habituated sequences through mutually implicated sensory and cognitive experiences. I stress the viewer not simply because motion often is registered by sight. Roman eyes, shooting out rays to grab at the surrounding world, were active. Romans equated seeing with knowing. From representation to shaped spaces, art invited roving eyes to impersonate moving bodies.[2] Paradoxically, static points most effectively lend significance to motion. The surface of water is featureless: registering its extent as a place for motion

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I have used the following abbreviations: *HN = Naturalis Historia*; *LIMC = Lexicon Iconographicum Mythologiae Classicae*; *LTUR = Lexicon Topographicum Urbis Romae*; *PECS = Princeton Encyclopedia of Classical Sites*; *RRC = Roman Republican Coinage*; *SHA = Scriptores Historiae Augustae, Vita Hadriani.*

1 See C. T. Lewis and C. A. Short's *Latin Dictionary* (Oxford: Clarendon Press, 1975), 5 vols. Cicero, *De finibus* 2.10.31: *voluptas* (pleasure) inheres in physical motion.

2 Many now explore these visual and verbal themes in landscape, urban armatures, houses, images public and private, and merge discussions of narrative with itinerary. See William MacDonald, *The Architecture of the Roman Empire*, 2 vols. (New Haven, Conn.: Yale University Press, 1982), who asks how any architectural unit intersects with sight, felt space, and motion generally (see vol. 1). For further bibliog.: on Rome, see Eva Margareta Steinby, ed., *LTUR* (Rome: Quasar, ca. 1993-2000); on other sites, see Richard Stillwell, ed., *PECS* (Princeton, N.J.: Princeton University Press, 1976); on myths, see *LIMC* (Zurich: Artemis Verlag, 1981–); on coins, see Michael Crawford, ed., *RRC* (Oxford: British Archaeological Reports, 1974).

depends on stations marked by static contours and protruding volumes: shores, marble margins, islands, or moated markers. At water gardens, multiple fixed views and viewing stations collaborated with the ambiguities of water motion. Without them itinerary could have no marked departure, arrival, or return.

I explore here Roman associations between water and motion—in the *world* and within the *person*—at two famous sites, Sperlonga and Hadrian's Villa, Tivoli. Their contours and implanted sculpture predicated voyage and immersion in natural waterscapes. Sperlonga, a seaside villa, includes a lagoon grotto and fishpond improved for the first Emperor Augustus, ca. 30 B.C. This condensed Mediterranean and its Odysseus gloss normative enjoyments of this coast, journeys associated with Rome's origin, and Augustus's difficult voyage to power. At Hadrian's inland riverine villa near Tivoli, ca. 130 A.D., the Canopus, a flooded stadium garden and artificial river source cavern, convokes the world rivers feeding the Mediterranean, as if the peripatetic Hadrian had authored both the global environment for his journeys of governance and its cultural geography. Each site embraced that numinous cavern form gnawed out by moving water over time[3] and appropriated as "my ocean, our sea (*mare nostrum*)," which distinctively focalized the Greco-Roman world. Each embodied that experience of traveling the navigable rivers or water roads that distinguished Italy and Egypt from most of Greece and Asia.

Though neither site lacks for commentary, scholars have barely considered their character as water gardens for motion: real, metaphorical, visualized, or denoted. This lack of focus in Landscape Studies has impeded full understanding of their sculpture and programs.[4] New here are simple descriptive stresses: on the visually obvious internal program, which activated and depended upon normative motion; on the depicted situation,

[3] The *exemplum* of Lucretius, *De rerum natura* 1.326–27, on nature's direction of destruction and genesis over a long duration is aptly how saltwater gnaws out caverns from sea cliffs. Similarly, the proof that nothing is solid is how "in rocks and caves (*speluncae*) the liquid moisture of water pervades, and all the rock weeps swollen droplets" (1.348–49). Such Roman fascinations are manifest in the addition of fake encrustations (as at Sperlonga and Tivoli) to any *nymphaeum* apse or vault in order to evoke age.

[4] For Sperlonga's Odyssean cycle, we discuss the figure style and composition of individual images, their formal sources, and usually simplistically correlate their subjects to literary texts. Other images and the site need additional work. Recently Christian Kunze dated the sculptures as Augustan by their lagoon masonry: "Zur Datierung des Laokoon und der Skyllagruppe aus Sperlonga," *Jahrbuch des Deutschen Archäologischen Instituts* 111: 139–213, esp. 165 f, 168 note 96 with bibliog. The sculptures are not much discussed in essays on Roman narrative and house programs, usually focused, save for the well-worked Villa dei Papiri, on fresco and mosaic. However, Richard Neudecker encouraged such studies in his magisterial catalogue of garden sculpture, *Die Skulpturenausstattung römischer Villen in Italien* (Mainz am Rhein: von Zabern, 1988). See index subentries under Sperlonga and Tivoli for detailed image catalogues. Sperlonga's pool is addressed as if one did not move or as if one walked it! "By leaving their banqueting couches, the Sperlonga diners could walk through this landscape and examine the groups individually. But the human and mythological worlds remained separate at Sperlonga, with mortals as observers rather than participants in the action": Anne Weis, "Sperlonga and Hellenistic Sculpture," *Journal of Roman Archaeology* 11 (1998): 415. Tivoli Canopus: The images' iconic "situations" are basically ignored. At least for Sperlonga, previous centuries of Italian knowledge of Homeric epic are acknowledged. However, William MacDonald and John Pinto, *Hadrian's Villa and Its Legacy* (New Haven, Conn.: Yale University Press, 1995), discuss the Tivoli subjects as "Greek," foreign, although some 700 years of Italian art had naturalized subjects like the Amazons.

which emphasized denoted motions toward and from, and on the response to these villas (built to afford daily commerce with the capital) in relation to the period's common knowledge of Rome's visual environment and public values. This last concern transfers to Landscape Studies the models developed for other iconographically charged Roman spaces, built for meaningful itinerary, which modeled ideal *persona* for patron and viewer: decoratively politicized public urban complexes and the pictorial animation of domestic interiors.[5] Hosting the court through the fourth century A.D., Tivoli and Sperlonga are among the few extant Roman decorated private places to which a well-understood patron known for broad artistic and intellectual interests and systematic public monument programs can be matched. The works of the "good" emperors Augustus and Hadrian launched paradigms to the Roman societies whose preceding tastes they exemplified. Their biographies show that they helped invest with emotion the water worlds they created in order to suggest voyages through danger and for pleasure.

Being Who, Where, When

Seducing us into fictional seas and rivers, these gardens let us impersonate the mariner or inhabitant of immense natural waters, moving *through* that element and being moved *by* it. Alternatively, their panoramic stages let the patron, at home in water, play at governing that element as ocean or river god, a moving *body* of water moving other *bodies*. Luxurious conceits of natural island and water-carved cave manipulated Roman iconographies of trap and refuge, to make delightful play with ideas of danger and release. Conversely, the obtrusive built-up contours of these displays and their technologies for stilling and transporting water invited an optic upon human mastery of nature. City as landfall on a river road was Rome's essence, its highest and oldest priestly office: *pontifex maximus* (bridgemaker). A prow stamped its earliest coinages. These little realms of country leisure mimicked grandiose harbor and aqueduct projects that forced water to sustain the human city. The Romans understood that taming water was a nation-making enterprise, as when they praised the Cloaca Maxima, that great sewer drain, which salvaged the city's heart from the fetid marshland of the original settlement from the earliest days of the Republic. The control and transport of water produced quintessentially beneficial technological wonders to which Republican nobles and emperors proudly gave their names as society's life-bringers.

Roman art staged macrocosm by constructed microcosm, and its pathways proffered

[5] John Clarke, *The Houses of Roman Italy, 100 B.C.–A.D. 250: Ritual, Space, and Decoration* (Berkeley: University of California Press, 1990); Bettina Bergmann, "Greek Masterpieces and Roman Recreative Fictions," *Harvard Studies in Classical Philology* 97 (1995): 79–120. My agendas: prior attempts in *Dynasty and Empire in the Age of Augustus: The Case of the Boscoreale Cups* (Berkeley: University of California Press, 1995), s.v. Forum Augustum, Ara Pacis, Pantheon, and Anaglypha Traiani; idem, "Culture and History at Pompey's Museum," *Transactions of the American Philological Association* 129 (1999): 343–73; idem, "Hellenistic Images of Spectacle, from Alexander to Augustus," in *The Art of Ancient Spectacle*, ed. Bettina Bergmann and Christine Kondoleon (New Haven, Conn.: Yale University Press, 1999), 97–122; idem, "Looking outside Inside: Ancient Roman Garden Rooms," *Studies in the History of Gardens and Designed Landscapes* 1 (1999): 7–35.

imagined journeys in the outer world. Images consistently invited observers to share time and place with what was depicted, even to complete the cast of a depicted story in any role the posited situation might allow. Grander spaces of house and villa are known as *representation rooms* where the viewed and viewing owner asserted a *persona* (literally, actor's mask). A Roman acted throughout the day the imperative roles of society, for leisure and power enacting historically or mythically splendid selves; so too in the open spaces within and around a house's built core.

"If I can see what is pictured to me," a Roman was acculturated to imagine, "where am I and who am I?" The most ordinary Roman, walking a bath hall's ocean mosaic floors or looking up from his soaking pools at frescoes of fish in blue water, joined oceanic divinities as he walked on water and inhabited its depths. In water gardens, definitive bodily sensations further mediated participation in another world by putting him in a firmly contoured, mastered model of the unbounded marine and/or the world rivers' immeasurable extent. Within such fences, water offers multiplicity of experience, not unbounded but still multifarious, that ranges contemporary audiences unused to the protracted pleasures of layered meanings. Romans designed to reward repeated exposure. All high arts of habitation served the different "weathers" of the social and inner person, just as house architecture accommodated the air and light of day and year. Complexly decorated places like these water gardens asserted a range of readings, moods, and tones, various to the point of antithesis and irony. They appealed to Roman tastes, which relished the skidding changes of subject and voice found in Horace's single poems and throughout the poem sequences in his books.

Landscape sensibility is acculturated. The classic instance is the Romantics' transformation of terror to elation in the face of precipitous topography. Acculturated above all is an understanding of the relationship with nature: philosophically, religiously, and historically. Because Roman *natura* was an active, moving agent, shaping the world *could* be felt as an imitative collaboration with *natura*,[6] not just as an action performed against passive substance. It is not possible to construct *with* water or arrange and plant it like earth. Nevertheless, the Romans redirected water's vital fluids to *natura,* to enable collaboratively every form of life,[7] just as we now like to arrange water's boundaries and locations.[8] *Natura naturans*

[6] Fundamental is Nicholas Purcell, "Town in Country and Country in Town," in *Ancient Roman Villa Gardens*, ed. Elisabeth Blair MacDougall (Washington, D.C.: Dumbarton Oaks, 1987), 185–203; on benevolent collaboration, see Mary Beagon, *Roman Nature: The Thought of Pliny the Elder* (Oxford: Clarendon Press, 1992); on Stoic vitalism, see Thomas Rosenmeyer, "Seneca and Nature," *Arethusa* 33 (2000): 103 ff.: The ruler within us, our tool for good, *natura,* balances the world (Seneca, *Quaestiones naturales* 3.10.3), implying that the political order also imitates *natura*. Pythagoreanism naturally linked soul, world, and action in a system of harmonies. Roman Epicurean philosophy in the abstract may not have preached vitalism, but practice and articulation did.

[7] For bibliog. on ideological landscapes of production, see my "Culture and History," 9–11, 29–30.

[8] Ovid, *Metamorphoses* 1.1–88: The genesis ordered by "Deus—et melior . . . Natura" (21), shapes the waters to make the lands (36–42); man is shaped from water and earth (82), the first work of art, *effigies*, by the artist of all things, so that crude earth now makes stories with the *figurae* of human beings—a model for animating landscape with sculpture.

builds watered grotto palaces, which we claim and replicate.[9] We too populate any miniature *orbis terrarum* (globe of the lands) with living *animalia*.[10] Moreover, these water gardens can hold up a mirror to nature's essential character. With compelling philosophy and seductive word-music, Roman *paideia*'s foundational voices on *natura* inculcated a perception[11] of nature as perpetual flux and cognition as perpetual motion. Topographies made of water, always movable or moving, potentially most afford the pathetic fallacy that movement of *person* and *persona* are identical. The installed art and iconic structures of these water gardens activate that equation.

Motion and Water

Our natural realm of motion is land. We move upright through the air we breathe, dependably on grounded feet or upon grounded living bearers or machines. Yet the world has two perceived realms where walking cannot take us: air and water. Another project of the Roman *imaginaire* existed around the journey through air, mimicked by art's bird's-eye view, pendant to the Roman images that sent them down into water, to look up through it in *fish*-eye view, veneering fountain niches, walls, and vaults of enclosed bath pools, floor mosaics, mid- and upper-wall fish fresco, and inlay.

Motion in water is neither simple nor safe, as the sculpture programs at Sperlonga and Tivoli make clear. To move in it physically requires wading or learning to swim in the face of currents, snags, and exhaustion. Boats may overturn or crash like circus chariots, as Hadrian's circus pool burlesqued; disrupted verticality submerges the human form in an element that can kill after a few moments. Calling a body of water navigable announces that it is too big for safe swimming. In water, we risk that currents of wind and water will balk our machines and get us lost like Odysseus to undesired or unknown ends. Boats offered speed, smooth-

[9] The inhabited cave as *locus amoenus* is key to the understanding of providential nature, as it combines a natural hall that provides shelter with water and plants. To enter a Roman cave is to move in *with* another being; the cave is the *domus* of gods, muses, nymphs, and sacred snakes. Hence, natural and constructed grottoes are described as being "that of —." Mythic inhabitants react to humans, answering questions (oracular caverns), welcoming, or lashing out at intrusion. For Hellenistic and earlier Greek sacred grottoes, gardened approaches, and interior ornament, see Brunilde Ridgway, "Greek Antecedents of Garden Sculpture," in *Ancient Roman Gardens*, ed. Elisabeth B. MacDougall and Wilhelmina F. Jashemski (Washington, D.C.: Dumbarton Oaks, 1981), 7–28. Esp. from Italy at Lokri come grotto models, some spouted or with statuettes of naked female bathers or nymphs. For the Roman elite's habit of making estates adjoin sacred spots (e.g., Scipio Africanus at Liternum: Pliny, *HN* 16.235), see John Bodel, "Monumental Villas and Villa Monuments," *Journal of Roman Archaeology* 10 (1997): 5–35, esp. 20–22. See Henri Lavagne, *Operosa antra: Recherches sur la grotte à Rome, de Sylla à Hadrien* (Rome: Ecole Française de Rome, 1988). Varro catalogued distinctive caverns (*specus*) as a species of sanctuary: Servius, *Commentary on the Aeneid* 4.56. For a cave view as resembling a window view, see Purcell, "Town in Country," 195–96. For the representation of views from or into caves, see my "Culture and History," 15–27; on sunken rooms, see notes 11 and 169.

[10] Hence the generally benevolent views of agriculture, animal husbandry, transplantation of species, and grafting species together. Making one *locus* evoke other memorable *loci* or model a world frame was symbiotic with the systems of keying personal memory.

[11] Cf. Stephen Hinds, "Landscape with Figures: Aesthetics of Place in the *Metamorphoses* and Its Tradition," *Cambridge Companion to Ovid*, ed. Philip Hardie (Cambridge: Cambridge University Press, 2001).

ness and directness of travel, and the chance to carry many times bodyweight in material goods far more easily and quickly than any means on land; but this ancient world was navigated only by direct sight of landmarks, from fear of the open sea's wind and water currents. The suddenness with which ships or swimmers could be driven off course meant bewildering danger never encountered on land because of a sprained ankle or broken cartwheel. In water battle, falling risked immediate death, as collapsing on land did not. Since souls needed to have their bodies burned or buried in order to be freed, especially horrible were visions, as at Sperlonga, of dying and being irretrievably washed away and devoured.[12]

Controlling a boat demands intelligence and strength. Its most potent realization demands that guiding intelligence organize a whole community of different skills. Hence Roman-era letters established on the earlier Greek legacy a distinctive European metaphor system. From Cicero to the Church fathers, a prow signaled any project. National or personal tribulation was imaged as the struggle to guide a boat's journey, and social violence was a storm raised or calmed by destructive or benevolent leaders. The economic and political lifeblood of all great ancient Mediterranean cultures flowed across seas and up rivers. Yet from the archaic Hesiod, important Greco-Roman authors represent water motion as driven by need or commercial greed. Roman villas emphasized the enjoyment of seacoast and riverside, but Horace, Ovid, and Propertius eyed those pleasures with suspicion. Hellenistic kings and elite Romans made boating a pleasure sport and constructed floating islands from luxurious yachts. Yet moralizing Roman satirists and historians depicted such tastes as indicators of dangerous instability or fluidity of character.

Romans graced motion in water with the panegyric gloss of political and religious staffage because water and air, unlike earth, consistently move. They seem like autonomously willful spirits, these personified waters venerated by Greco-Roman belief and their hordes of tritons, nymphs, and fabulous sea beasts.[13] Ocean encircled all land, under which ran real rivers and Hades' streams. After death, the soul traversed these waters, whether to the island paradise at Ocean's furthest edge or ferried across Styx by a monstrous boatman. Journey to and from furthest Ocean was transformative, made by special beings,[14] like an-

[12] The Greeks' epic *topos* is a terrible river battle. See C. J. Mackie, "Scamander and the Rivers of Hades in Homer," *American Journal of Philology* 120: 485–501, esp. 494 f. the hero's quest to cross the bitter rivers of Hades. Roman fears crystallize in the *Aeneid's* stories about Aeneas's pious retrieval of drowned companions, to explain why the Italian coastal cities erected monuments that met sailors in warning and consolation. Cf. Alessandro Barchiesi, "Palinuro e Caieta: Due 'Epigrammi' Virgiliani (*Aeneid* 5.870 sg.; 7.1–4)," *Maia* n.s. 31 (1979): 3–11. In Vergil's Palinurus story and Ovid's appalling narrative of Ceyx's drowning (*Metamorphoses* 11. 430–572, 650–748), the living suffer visitations from the desperate souls of the drowned.

[13] Scientific exploration of northwestern Europe provided knowledge of real tritons and nereids. Pliny, *HN* 9, narrated sightings in Augustan Gaul and Spain.

[14] Philip Hardie, *Virgil's Aeneid: Cosmos and Imperium* (Oxford: Clarendon Press, 1986), 169–70, 308–10, 316, and 298 ff., under the index subheading Cosmic Setting; James Romm, *The Edges of the Earth in Ancient Thought: Geography, Exploration, and Fiction* (Princeton, N.J.: Princeton University Press, 1992).

cient heroes, demigods, and historical leaders later deified, such as Alexander returning from India or Caesar from Britain.[15] Extravagant water journeys endowed prospective immortality, whether of reputation or soul. Like Neptune, Rome's triumphant admirals and *piscina* patrons governed the sea. The first Emperor Augustus made this a hallmark of the prospective *divinus* or canonized *divus* emperor.[16] Voyaging into death,[17] anyone might aspire to join Venus in her shellboat for Elysium.[18] Felicitous images in the home[19] let humans walk on water like gods[20] and turned its rooms into idyllic archipelago.

Roman sociology and economy gave water special aspects. Not every Roman had bodily memories of nautical voyages, but all knew the sensations of *natatio* (swimming) for pleasure and health.[21] Many cultures like the feeling of water on the skin but not all like

[15] Rarer are imagined journeys to the water's distant floor, e.g., Theseus visiting his divine parent's sea palace. Vernacular histories collected in the early medieval *Alexander Romance* and the Islamic world discussed Alexander's descent in a glass bathysphere. See below on Roman hero stories about penetrating to the sources of fresh waters. The widespread myths about water beings drawing humans fatally into their homes are apotheoses too, for many were the *aition* for venerable hero and nymph cults.

[16] I (as above, note 5, *Dynasty and Empire*) have been interested before in victory on the sea and the imagery of imperial *adventus* by water and its place in the binary *terra marique*. Here note how much is for private display. Augustan cameos and intaglios and the Primaporta Augustus are discussed here. Imagery of the Neptune-emperor needs synthetic analysis.

[17] For the lifesize fleet decorating Alexander the Great's pyre for Hephaistion and Roman-era imitations, see my "Hellenistic Images of Spectacle," 102, 118–90; cf. the *rostra* appended to funerary altars of Julio-Claudian Rome.

[18] Marine iconography is prominent in Roman funerary art. Here cf. the marine sarcophagi of the 2d to 4th century A.D., where a sea *thiasos* of tritons and nereids bears a bust of the deceased to Elysium, often in the shell of Venus's birth from the sea: Andreas Rumpf, *Die Meerwesen auf den antiken Sarkophagreliefs* (Berlin: Grote, 1939), 152–70, cat. nos. 74 ff., and 218 (human or cupid fishers); *Catalogue des sarcophages en pierre d'époques romaines et paléochrétiennes*, ed. François Baratte and Christine Metzger (Paris: Éditions de la Réunion des Musées Nationaux, 1985). Many sarcophagi frame other themes between Earth and Ocean. See Baratte, *Catalogue des sarcophages*, 144, 218; Anna Marguerite McCann, *Roman Sarcophagi in the Metropolitan Museum of Art* (New York: Metropolitan Museum of Art, 1978), cat. no. 17, 94–106, esp. 95, 100; Diana Kleiner, *Roman Sculpture* (New Haven, Conn.: Yale University Press, 1992), 393, fig. 362. The Christianized equivalent is the Jonah sarcophagi, note 90. A 3d-century variant is the idyllic island before a detailed port representation. See Guntram Koch and Hellmut Sichtermann, *Römische Sarkophage* (Munich: Beck, 1982); Guntram Koch, *Frühchristliche Sarkophage* (Munich: Beck, 2000). Marine apotheosis is common in chambered tombs in fresco, stucco, and mosaic.

[19] The domestication of public imagery needs surveying. See Clarke, *The Houses of Roman Italy*, 187–88; my "Culture and History," 13, 18–26 note 52. Sculptural imagery in the Roman garden and atrium at real pools and wall fountains, or evoking them, is well known.

[20] For the sea-carpet floors esp. common in North Africa (the water-car of Neptune and Amphitrite, Venus, or Peleus and Thetis), see Katherine Dunbabin, *The Mosaics of Roman North Africa: Studies in Iconography and Patronage* (Oxford: Clarendon Press, 1978); *LIMC*, s.v. Venus, and s.v. Eros/Amor for the boating Amores of houses, sarcophagi, and tombs.

[21] Erwin Mehl, "Schwimmen," *Paulys Realencyclopädie*, suppl. 5 (1931): 847–64, and *Antike Schwimmkunst* (Munich: Heimeran, 1927). I thank Nicholas Horsfall for this reference. J. De Laine, "Roman Baths and Bathing," in the *Journal of Roman Archaeology* 6 (1993): 348–58, notes "the stunning private bath from the Republican Villa di Prato near Sperlonga" and recent work on how the healing powers of water are transferred from sacred springs to baths.

immersing or swimming in it. Many put water into gardens to look at and consciously gaze on river or ocean shores. Distinctively, Romans combined use, beauty, and pleasure, arranging waters, both fresh and salt, to look at as art's frame, and in which to raise fish for food and spectacle, to swim in and boat upon. The fishpond (*piscina*), industry and ornament alike, from the second century B.C., is much studied.[22] Roman texts call "inventors" those who perfected already existing genres or practices. So the sources pin large-scale *piscina*, aviary, and gamepark practice on patrons of the early first century B.C., but the arts show that, as with house gardens and pools, these villa practices date from the second century B.C.

A wonderful document is the second-century B.C. House of the Faun in Pompeii. Its grandeur and the careful preservation of its ancient decor convey that it was a centerpiece for town notables. Its program comments upon luxurious water exploitation: an atrium garden pool; mosaics making indoors a maritime *piscina* and courtyard pool; and, actually in a garden court, a riverine fiction. The *piscina* fiction, where we look from under seawater past fish to air and rocky spurs, decorated the *tablinum*, the atrium's main public reception room adjoining its *impluvium* pool. That pool's central dancing satyr, providing the house's modern name, introduced visitors to a Dionysiac "freshwaterscape" on first entrance. The *tablinum*'s enormous window surveyed the garden court whose further portico path was edged by a densely populated Nilotic strip. Visitors stepped over this running Egyptian "river" to see the Alexander Mosaic, which illustrates a battle in Asia to which Alexander had come from Egypt. Another panel, modified from standard bisected formats of a *xenia* (dinner items) panel, reviews a long house pool from a diner's point of view. The foreground rim holds *piscina* produce (the *tablinum* panel's cockle and fishes) and fat little birds from an aviary. On the far rim, a house cat excitedly attacks a larger ornamental bird, burlesquing a ravening lion. Down the pool swim ducks toying with *lotos*, excerpted from the courtyard Nile motifs, as if we see a Republican *eurippus* channel or the moat of an aviary/*piscina* pavilion like Varro's.[23]

Less meditated was the use of large *piscinae* for immersion and swimming.[24] Those motions suggest that the owners or viewers of such pools and their images were superior beings, ruling or preying upon water's animals. Roman nobles were known to costume themselves as tritons to dance and writhe across banquet halls.[25] Boating, human fishlords imitated Neptune's sea chariot. Water's threats could cause fear of a monstrous attack by its

[22] Mosaic fish floors of the later 2d century B.C. gave even urbanites a pleasant gaze upon fish in enclosures, such as the carefully partitioned shallow pool modules of the energetic breeder, as at Sperlonga.

[23] Illust. in J. J. Pollitt, *Art in the Hellenistic Age* (New York: Cambridge University Press, 1986), 326–40.

[24] Cf. the *stagnum* (any clear or marshy pond desired for productive estates, but also a large aestheticized tank for boating like Agrippa's in the Campus Martius and Nero's) now under the Flavian Colosseum: see Nicholas Purcell, "The Roman Villa and the Landscape of Production," in *Urban Society in Roman Italy*, ed. Tim Cornell and Kathryn Lomas (New York: St. Martin's Press, 1995), 151–79; and "The Roman Garden as a Domestic Building," in *Roman Domestic Buildings*, Ian Barton, ed. (Exeter: University of Exeter Press, 1996), 121–51. See also images in my "Culture and History," 23.

[25] Antony's *amicus* Munatius Plancus: Velleius Paterculus, 2.83.2; see my "Hellenistic Images of Spectacle," 99, 101. For Cleopatra's seduction of Antony on a river barge staffed with costumed nymphs, Graces, and Erotes looking like Venus in a painting, see Plutarch, *Antony* 36.1–3.

denizens. Its hungry, potentially deathly reach was eroticized when water gods rose up to rape women and nymphs; water nymphs drowned beautiful youths; and man-eating monsters like Scylla distorted the body's hungers. Yet, as Neptune was loved by his nymph wife and amorous tritons bore up nereid consorts to embody water's sensual embrace, humans could love and be loved by water's inhabitants. Crassus wept at the death of his pet eel; Italy preserved the myth of Arion, a human rescued by a dolphin.[26] This culture of regular *natatio* eroticized swimmers, whether mythical men like Polyphemus looking at Galatea or real women like Claudia, whom Cicero in *Pro Caelio* 36 libeled for ogling *horti* youths at Tiber-side swimming grounds.

Elites make grand landscapes. The Romans especially distinguished leadership as journey. The *cursus honorum*, the upper class's normal political course of offices, enforced a literal *cursus* throughout the empire's seas and lands. From the third century B.C., the normative life of any rich or noble Roman entailed repeated traverse from one end of the Mediterranean to the other for war, enrichment, administration, tourism, pilgrimage, or education. No wonder Fortuna governed personal and national fates, cities, and oceans with the steersman's rudder.[27] The watery geography of achievement informs geographic encyclopedias for war and commerce, which were conventionally structured on the periplus,[28] sailing a coastline in which genre the formative Republican age of water villas took special interest.[29] From the third century B.C., the Roman imagination was fed in the Roman Forum; the leaders of state, pleaders of political cause, and orators at elite funerals were viewed standing over stylized war fleets. The heart of sea-won empire, the platform was called the *rostra* ever since the prows of the enemy fleet from Carthage were fixed on it, and Augustus made a pendant one with Cleopatra's rams. The *res publica*'s foundation upon steersmanship could find no better visual metaphor.[30]

[26] Arion was claimed by Tarentum as well as Spartan Taenarum. Friends wrote to Augustus from their villas about a boy's scaly friend at Puteoli harbor; see Pliny, *HN* 10.25.

[27] Seneca sardonically begins by comparing Philip or Alexander, a killing *pestis mortalium* (human epidemic), to a flood—the kind of event he puts in the realm of Fortuna's, which (cf. already Cicero, *De officiis* 2.6.19) includes storms and shipwrecks; Seneca, *Quaestiones naturales* 1.14: "[N]ot only humans but cities, coasts, and the sea itself come under the yoke of *fatum*." See Rosenmeyer, "Seneca and Nature," 112–13.

[28] Lionel Casson, *The Ancient Mariners: Seafarers and Sea Fighters of the Mediterranean in Ancient Times* (Princeton, N.J.: Princeton University Press, 1991); P. A. Brunt, rev. of H. D. Meyer (1961), "Die Aussenpolitik des Augustus und die Augusteische Dichtung," in *Journal of Roman Studies* 53 (1963): 170–76 = *Roman Imperial Themes* (Oxford: Clarendon Press, 1990), 96–109; Claude Nicolet, *Space, Geography, and Politics in the Early Roman Empire* (Ann Arbor: University of Michigan Press, 1991), 5, 69–71, 81–82, notes 38–45; Richard Talbert, "Rome's Empire and Beyond: The Spatial Aspect," in *Gouvernants et gouvernés dans l'Imperium Romanum (IIIe siècle av. J.C.–Ier siècle ap. J.C.)*, 215–23 (Quebec: UQP, 1991); G. Sundwall, "Ammianus Geographicus," *American Journal of Philology* 117: 619–43. Hence, maps like the Madaba mosaic include ships at shorelines. On sailing images, see O. Höckmann, "Das Schiff," in *Das Wrack: Der antike Schiffsfund von Mahdia*, ed. Gisela Hellenkamper Salies et al. (Cologne: Rheinland Verlag, 1994), 53–81.

[29] Nicolet, *Space* (as above, note 28), 81 note 42.

[30] Hellenistic and Roman ships destroyed each other by backing into their wooden sides, driving home toothed bronze rams (*rostra*) weighing a ton or more mounted at the ship's rear. This required coordination of oarsmen and fleet by commanders. The manipulation of these heavy rams into trophies also commanded awe.

With the shift from republic to empire, Augustus's *itinerarium principis*, the solicitous leader's voyage *terra marique* (by land and sea) solidified Republican paradigms of virtuous exertion.[31] "Through you, we live, we sail, we are free and fortunate."[32] Neptune-emperors guarded the seas from turmoil and human predation. These journeys of person and nation revived Rome's founding myths of fraught water voyage toward a new home and identity: the mass migration of the defeated Trojans under Aeneas's leadership, across the Mediterranean from Asia to Greece, Africa, Sicily, and finally up the Tiber to primordial Rome's marshy valley. The city's founder Romulus was cast adrift in infancy, then floated to land by the river's solicitous deeps, and providentially suckled by the she-wolf in a shaded grotto (Lupercal) historically revered at the Palatine.[33] All cultured Romans knew the epics of Mediterranean journey: Homer's archaic *Odyssey* and *The Returns* ascribed to him, Apollonius's Hellenistic *Argonautica*, and their own Latin national epics like Ennius's Republican *Annals* and Vergil's Augustan *Aeneid*. Since the archaic period, Italy and Sicily, abetted by eastern Greek critics and allies, made the epics narrate foreigners' adventures to found Italian cities and clans.[34] Roman investment in water motion has been documented in the most intimately enjoyed arts, starting with the earliest signature known of a Roman artist: The fourth-century B.C. Ficoroni Cist limned the Argonaut adventures at island and spring for a Latin woman's boudoir at Palestrina.[35] When the elite developed *villegiatura* by water, they laminated it to heroic myth, as at Sperlonga. Exemplary is how a mural (the "Odyssey Landscapes") at a first-century B.C. suburban mansion in Rome's Esquiline *hortus* zone centered on a *villa maritima* as Circe's palace. By the late first century A.D., Emperor Domitian planted a villa

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For Roman conquerors represented standing over their ships on statue bases, see my "Some New Grounds for Narrative: Marcus Antonius's Base (The Ara Domitii Ahenobarbi) and Republican Biographies," in *Narrative and Event in Ancient Art*, ed. Peter J. Holliday (New York: Cambridge University Press, 1993), 218; and my "Hellenistic Images of Spectacle," 102 and note 19. At Actium, Augustus similarly faced a colossal podium for Apollo of Leukas at his new victory city Nikopolis. See William Murray and Photios Petsas, *Octavian's Campsite Memorial for the Actian War* (Philadelphia: American Philosophical Society, 1989), 72, note 78; on these column statues, see 84–94; on the Republican *rostra*, 109–10; on Augustus's reshaping, 117–24; on dedicating 10 of his own warships at Cape Actium, 116–17.

[31] Helmut Halfmann, *Itinera principum: Geschichte und Typologie der Kaiserreisen im römischen Reich* (Stuttgart: Steiner Verlag Wiesbaden, 1986).

[32] For grateful Alexandrian merchant ships ritually acclaiming Augustus at Puteoli harbor on his last *villegiatura* cruise, see Suetonius, *Augustus* 98.

[33] Cf. Ovid, *Fasti* 2.381 ff. and 3.1 f.: Mars's impregnation of Rhea Silvia, lulled to sleep on the banks of the Tiber to the sound of its waters. Lost public graphic cycles inspired, e.g., the frieze (Romulus and Aeneas) at an aristocratic Esquiline house tomb in the 1st century B.C.; Ernest Nash, *Pictorial Dictionary of Ancient Rome* (New York: Praeger, 1968), s.v. Columbarium of the Statilii; Richard Brilliant, *Visual Narratives: Storytelling in Etruscan and Roman Art* (Ithaca, N.Y.: Cornell University Press, 1984), 31, fig. 1.3.6–7; restored at the Palazzo Massimo.

[34] Irad Malkin, *The Returns of Odysseus: Colonization and Ethnicity* (Berkeley: University of California Press, 1998), reviewed by E. Cook in *Bryn Mawr Classical Review* 00.03.22; T. P. Wiseman, "Legendary Genealogies in Late Republican Rome," in *Roman Studies Literary and Historical* (Liverpool and Wolfeboro, N.H.: F. Cairns, 1987), 157–60.

[35] Handsome nude youths for the female gaze of Dindia Macolnia and her daughter: cf. Claudia (Cicero, *Pro Caelio* 36). Donald Strong, *Roman Art* (New York: Penguin, 1988), fig. 2; Tobias Dohrn, *Die Ficoronische*

on her promontory by Circei, to dine dangerously in magical ease, looking toward Sperlonga, whose depicted Odysseus had not yet reached her mansion.[36]

The Water Garden, Reading: A Note

Throwing texts at art proves what has been made and what it means. I deploy Roman texts but for purposes intrinsic to reconstructing garden sensibilities. Picturing and being pictured include what is heard and read. Rhetoric, poetry, drama, and history aim to make one see events, as scholars increasingly address in their research, and to put one into the place, time, and shared situation of verbal exposition. Even the unlettered expected to be thrilled by public oratory and performance. The lettered labored since childhood at rhetorical exercises demanding that they enact someone else's story: "Art fortified literature and history."[37] What to feel and how to identify oneself in the iconic Roman artscape: paradigmatic literatures offered the scripts, and designed landscape offered stages on which to impersonate those canonic stories.[38] Conversely, cultures use their materiality to understand their texts' visual and material terms, and Roman art patrons regarded themselves as authors. It is as more than "illustration" that I match experience of the *Odyssey* to inhabiting Sperlonga and characterize Hadrian at the Canopus as the Aristaeus of the now-canonic *Georgics*. To Greek assertions that environment shapes human properties, the Romans added an understanding that event, history, and emotion may be accidents of place and space. Sperlonga's hyperrealist images of the *Odyssey* in "real" sea and rock recall Lucretius's *De rerum natura* and his statement to this effect, purposely making his exemplar the Iliadic disaster at Troy from which his Rome was born and equating burning emotions to real

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Ciste in der Villa Giulia in Rom (Berlin: Gebr. Mann, 1972), listing pictorial analogues to ship and beach scenes: the Argonauts, their ship beached at an island landfall, drink at a spring; the Dioscuri bind to a tree the defeated evil boxer, King Amykos; Silenus guards the rock spring, a Dionysiac *locus amoenus*. The sophisticated engraving replicates public master paintings at Rome. Burial perhaps exploited salvific potential in this water quest imagery; on Sperlonga's Argo, see 18.

36 Ralf Biering, *Die Odysseefresken vom Esquilin* (Munich: Biering and Brinkmann, 1995); illust. in Pollitt, *Art in the Hellenistic Age*, fig. 198, 185–88, bibliog. 298, note 1. The visual villa equation is mine. This is the contemporary painter's focalizing interpolation in a master narrative set in a stunning rocky shore landscape, drawn from a Hellenistic (Italian) Greek source: P. von Blanckenhagen, "The Odyssey Frieze," *Römische Mitteilungen* 70 (1963): 100–146. For Domitian's villa at Sabaudia, see Harald Mielsch, *La villa romana* (Florence: Giunti, 1990), 101–2.

37 MacDonald and Pinto, 189, on Tivoli.

38 Hinds, "Landscape with Figures"; bibliog., my "Culture and History," 343–73 s.v., 351–53; Bettina Bergmann, "Painted Perspectives of a Villa Visit: Landscape as Status and Metaphor," in *Roman Art in the Private Sphere: New Perspectives on the Architecture and Decor of the Domus, Villa, and Insula*, ed. Elaine Gazda (Ann Arbor: University of Michigan Press, 1991), 49–69; ibid., "Visualizing Pliny's Villas," *Journal of Roman Archaeology* 8 (1995): 406–20; ibid., "Rhythmus of Recognition: Mythological Encounters in Roman Landscape Painting," in *Im Spiegel des Mythos: Bilderwelt und Lebenswelt*, ed. Francesco de Angelis and Susanne Muth (Wiesbaden: Dr. Ludwig Reichert Verlag, 1999); John Winkler on the novel *Daphnis and Chloe*, in *The Constraints of Desire: The Anthropology of Sex and Gender in Ancient Greece* (New York: Routledge, 1999), 101–28; Ann Vasaly, *Representations: Images of the World in Ciceronian Oratory* (Berkeley: University of California Press, 1993), on forensic address; Eleanor Windsor Leach, *The Rhetoric of Space: Literary and Artistic Representations of Landscape in Republican and Augustan Rome* (Princeton, N.J.: Princeton University Press, 1988); Herwig Blum, *Antike Mnemotechnik*

flames.[39] Story itself may generate lands and waters, as throughout Ovid's *Fasti* and *Metamorphoses*, which inhabited the water gardens of the first century B.C.

Sperlonga

Sperlonga is within a day's land journey south of Rome. Republican pleasure seekers liked the comfortable, lovely journey by sea along the villa coast between Anzio and the Bay of Naples. It is best known for its early imperial pool sculptures. Archaeological dating of the pool's masonry shows that Augustus rather than Tiberius initiated the famous symposium complex.[40] He regularly visited en route to Capri, his personal island. He died on such a cruise, a short boat ride from the siren islets at Sorrento's Cape of the Sirenoussae, whose peak held a shrine Odysseus built.[41] That Augustan character is fully understood only when we see how this villa was elaborated since the early first century B.C., each phase preserved to frame and be reframed by the next.

Accessible by the Via Appia was a clifftop prospect villa refreshed by sea air and with a deep beach lagoon and cave below.[42] By late second century B.C., Romans cherished the

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(New York: Olms, 1969); Mary Carruthers, *The Craft of Thought: Meditation, Rhetoric, and the Making of Images, 400–1200* (New York: Cambridge University Press, 1998).

[39] Lucretius, *De rerum natura* 1.469–70, 1.481-82: "[W]hatever it is that will have been done (*actum*) can be called a kind of accident (*eventum*) either of the earth in general or of specific regions"; l.478 and 1.481–82 convey that histories of action (*res gestae*) are better called the *eventa* of body and place.

[40] Kunze, "Zur Datierung des Laokoon"; Harald Mielsch, *Die römische Villa: Architektur und Lebensform* (Munich: Beck, 1987), 102–4, 116–17; bibliog. on 160, note 167. Of 554 significant fragments found, about 100 belong to our groups. In general, see Weis, "Sperlonga and Hellenistic Sculpture" (review of Nikolaus Himmelmann's excellent *Sperlonga: Die homerischen Gruppen und ihre Bildquellen* [Opladen: Westdeutscher Verlag, 1995]), *Journal of Roman Archaeology* 11 (1998): 412–20; Weis, "Odysseus at Sperlonga: Hellenistic Hero or Roman Heroic Foil?" in *From Pergamon to Sperlonga: Sculpture and Context*, ed. Nancy T. De Grummond and Brunilde Ridgway (Berkeley: University of California Press, 2000), 111–65, esp. 134 f., installation, seats, stairs, lighting for the images. In *From Pergamon*, see also Ridgway, "The Sperlonga Sculptures: The Current State of Research," 78–91; and J. J. Pollitt, "The Phantom of a Rhodian School of Sculpture," 92–110. Weis identifies Aeneas and Lausus of the Odysseus with a corpse; *contra* (I concur), see Peter Green, "Pergamon and Sperlonga: A Historian's Reactions," in *From Pergamon*, 166–90 at 182 f. Weis, in "Sperlonga and Hellenistic Sculpture," note 2, and "Odysseus at Sperlonga," dismisses Kunze's interpretation because (unexplained) the date seems early. See A. Stewart, "To Entertain an Emperor: Sperlonga, Laokoon, and Tiberius at the Dinnertable," *Journal of Roman Studies* 67 (1977): 76–90, for spectacularism, mythographic erudition, ancient sources' evil Tiberius. Pollitt, *Art in the Hellenistic Age*, 122 f., figs. 125–26; R.R.R. Smith, *Hellenistic Sculpture: A Handbook* (London: Thames and Hudson, 1991), figs. 144–47 (143, Laocoön), 110–11; Bernard Andreae, *Ulisse: Il mito e la memoria* (Rome: Progetti Museali, 1996); Bernard Andreae, esp. *Praetorium Speluncae: Tiberius und Ovid in Sperlonga* (Stuttgart: Steiner, 1994), and "Andere Ansichten von Sperlonga," in *Die alten Sprachen und die bildenden Künste* (Stuttgart: Landesinstitut für Erziehung und Unterricht, 1999), 38–53. In *Alten Sprachen*, see also H. Walter, "Der Stand der Diskussion um die Ausgrabung von Sperlonga nach der Publikation von Nikolaus Himmelmann, 'Ansichten von Sperlonga,'" 54–67. Stylistic analysis intertwines with the Laocoön; see note 108.

[41] Strabo, 5.4.8: Naples's monument to the Siren Parthenope hosted gymnastic games that Augustus attended.

[42] Not addressed in *From Pergamon*. Cf. Columella's Neronian-era prescriptions for villas overlooking

sea caves of the villa coasts and islands for fish farming and aesthetic pleasure.[43] Fairly isolated on its stretch of coastline, here the colossal dark mouth prominent to pleasure cruisers gave Sperlonga its sobriquet: cavern (*spelunca*). Around 80 B.C., a wealthy owner who bred fish in the lagoon would have prized this covered inner pool to shade them. Romans liked villas with neighbors. Down the shore, a productive *villa rustica* adjoined a freshwater river cascade, another prized amenity. Sperlonga's neighbor also acquired fine water prospect architecture and an extraordinary ramp over the Via Appia that reached an immense beach portico.

The sites may have been unified previously, but if not, Augustus would have bought the property to enlarge Sperlonga for security and to give it a working agricultural estate as well as the cascade.[44] Between 37 and 31 B.C., he and Agrippa reshaped this coastline. For the war against Sextus Pompey's piratical fleets that were based in Sicily ca. 37 B.C., they made Cumae's Portus Julius[45] and for the Actian campaign against Antony in 31 B.C., a colossal harbor at Misenum.[46] The villa probably belonged to the Octavii, Augustus's birth clan, to the Julii, his adoptive clan, or to one of his wife Livia's clans, the Claudii or Livii. The Via Appia trunk is suggestive.[47] Surely Augustus used this site in the 30s while on his great harbor-building projects, just as in the 30s he started to use Livia's villa at Primaporta as a refreshing habitation nearer Rome.

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the sea and set back from it, both within reach of refreshing spray (*De re rustica* 1.5.5–6). Cf. Bergmann, "Painted Perspectives."

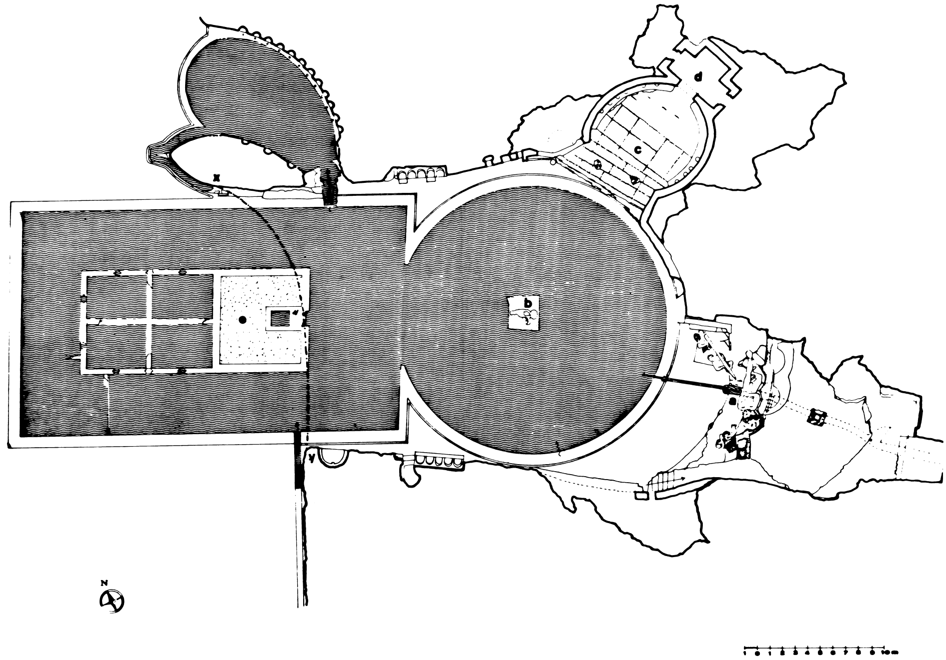
[43] Strabo, 5.3.6: The many coastal caves often adjoin estates. James Higginbotham, *Piscinae: Artificial Fishponds in Roman Italy* (Chapel Hill: University of North Carolina Press, 1997), and X. Lafon, "Piscinae et pisciculture dans le bassin occidental de la Mediterranée," *Journal of Roman Archaeology* (1998) 11: 573–82 [review].

[44] Mielsch, *Villa romana*, 47–48, fig. 23. The cascade was bridged to a cliff pavilion, and there was no *piscina*. Perhaps Sperlonga's was shared early on.

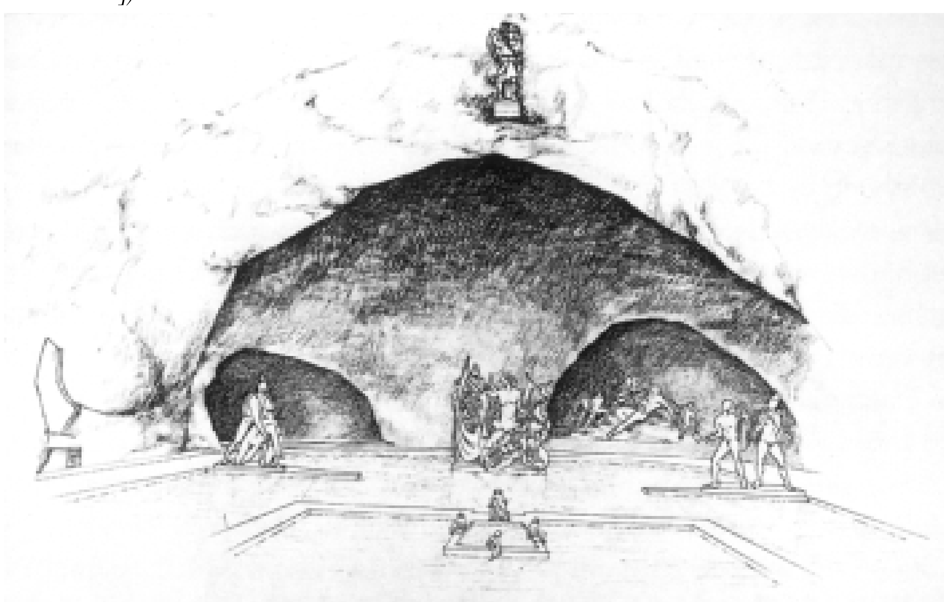
[45] *PECS*, s.v. Inside Cape Misenum on the Bay of Naples, Cumae's *campi Phlegraei* were considered an entrance to Hades. Vergil described Cumae's grotto as an ancient oracle of Apollo's Sibyl. This cavelike *cryptoporticus* with three rock-cut basins overlooked the sea through nine arched bays. Its innermost *adyton* was a larger chamber with two side recesses. The crypt's entrance was linked to stairs up to Apollo's temple and a ramp down to a *cryptoporticus* that the architect Cocceius built for Augustus.

[46] *Spelunca* as a *praetorium*, later a common imperial palace term (Tacitus, *Annales* 4.59), reflects that it was a station on official *peregrinatio*. Cf. Misenum's (*PECS*, s.v.) circular inner harbor (foreground spits crossable by wooden bridges). Antony's villa perhaps held a breakwater promontory, a nice irony. In A.D. 37 Tiberius died here at Lucullus's villa. Augustus had surely impounded both already. See Strabo, 1.2.9, where Odysseus encounters the man-eating Laestrygonians here (cf. "Odyssey Landscapes"). Also, Augustus built large *piscinae* for Portus Julius nearby; see Lafon, "Piscinae et pisciculture," 576, 581, and *piscinae Caesaris* at Ankara/Ancore, and Pausilippon.

[47] Baia, *PECS*, s.v., also with a fabulous cavern (Great Antrum) regularized for descent to a hot spring and inner hall, an Augustan construction under the Hadrianic swimming pool (*natatorium*), the Baths of Venus. Caesar's villa: Seneca, *Epistles* 51.11; Tacitus, *Annales* 14.9 (now Augustus's). On ideological *pietas* toward keeping up family estates, see Bodel, "Monumental Villas," 11–12. A painted grotto garden room was added at Primaporta when it was remodeled in the 30s. See my "Culture and History," 26–30.



1. Sperlonga: Plan of the piscina*, dining island, and grotto (from E. Salza Prina Ricotti, "The Importance of Water in Roman Garden Triclinia," in* Ancient Roman Villa Gardens*, ed. Elisabeth Blair MacDougall [Washington, D.C.: Dumbarton Oaks, 1987])*



2. Sperlonga: Reconstructed view from the dining island of the cave with sculpture placement restored, dining island panisci*, and the Julio-Claudian Homeric cycle of the cave, ca. 100 to 80 B.C. (from G. Iacopi,* L'Antro di Tiberio a Sperlonga *[Rome: Istituto di Studi Romani, 1963])*

Time for Dinner 1

What was the pleasure cave of which Augustus took possession? In its first aestheticized phase, a dining island was founded in the middle of the *piscina* (Figs. 1, 2). This offered views into the enormous cave, dimly lit in blue by water reflections, and back over the sea to further islands and promontories. Inside the cave, a shallow recess was cut and later enlarged for the Augustan Polyphemus group. Perhaps such a group was put there, for the Cyclops cave was set not only in Sicily but also at nearby Cumae. The identification of Terracina/Circei nearby with Circe's locale was ancient, and from this villa the promontories identified with Circe's fantastical sea villa were visible. Odysseus's larger Italian coastal itinerary was brought to life by the Augustan sculptures.[48]

This *piscina* pavilion with its ornamental basin is one of the earliest *triclinia* (water dining rooms), almost a water atrium. Its top layer is on the surface[49] over the *piscina*'s little nests (half-amphora shells) that fish inhabited. Diners observed the fish in the island's normative grid of sequestered pools, a spectacle that Republican mosaic fish floor panels endorsed.[50] They also saw colored forms swirl to the platform, leaving their holes[51] to take food diners tossed. Visitors arrived like Neptune coming home from the sea, reveling in having fish swim up under the table they would shortly lie upon. This was a Roman pleasure up through the Gothic conquest.

The island's pool grid was floored as needed by temporary planking. It was reached by

[48] Strabo, 5.3.6: Ringed by sea and marsh, the promontory's Circe shrine displayed Odysseus's cup. On Cyclops art in Republican Italy and the tragicomic banquet effect and Dionysiac flavor, see Weis, "Sperlonga and Hellenistic Sculpture," 414–15; on Scylla, Odysseus, and Cyclops in Hellenistic (Etruscan) Italy, see Stephan Steingräber, "Pergamene Influences on Etruscan Hellenistic Art," in *From Pergamon* (as above, note 40), 235–54, esp. 235–39. On Scylla in Sicily, see, e.g., Brunilde Ridgway in *Archaeology* 21 (1968): 230–31, and "The Sperlonga Sculptures," 85, and notes 20–25, discussing Italian parallels for Sperlonga. See also Nancy T. De Grummond, "Gauls and Giants, Skylla and the Palladium: Some Responses," in *From Pergamon*, 262–68, Italian pedigree, 255–77, esp. 271–73, noting topographic reference.

[49] Mielsch's survey in *Villa romana* affords contextualization in maritime villa *piscinae* and grottoes of the 1st century B.C. and early empire. E. Salza Prina Ricotti, "The Importance of Water," in *Ancient Roman Villa Gardens* (as above, note 6), 137–84, esp. 138, 168–69, the best topographic and inhabitation-oriented discussion, alone considers motions required by Roman water gardens in light of another much-neglected reality, the servant entourage. For Tivoli, I propose its sculptural figuration.

[50] The basin transposes the typical *U*-shaped couch triad around a fish mosaic *emblema* at maritime villas "where the eye could sweep south to the horizon of the sea, and back to the central part of the atrium," a Dionysiac bucolic setting. See Richard Neudecker, "The Roman Villa as a Locus of Art Collections," in *The Roman Villa: Villa Urbana*, ed. A. Frazer (Philadelphia: University of Pennsylvania Museum, 1998), 77–92, esp. 86. For dinner resembling fishpools, see Horace, *Satires* 2.8.42–43: a *murena* (eel) served, shrimps swimming around in a "broth" sea.

[51] See Salza Prina Ricotti. Obviously, cf. Varro's moated island with fish and duck nests in his riverine villa (*De re rustica* 3.5.8); its water floor between fishpools could also have a platform at need. See Mielsch, *Villa romana*, 14–16, figs. 4–5; A. L. Littlewood, "Ancient Literary Evidence for the Pleasure Gardens of Roman Country Villas," in *Ancient Roman Villa Gardens* (as above, note 6), 7–30 esp. 12, 14–15. See Mielsch, *Villa romana*, 24–29, 56–58, 63–64 for 1st-century B.C. and imperial *piscina* pools and grotto systems, platforms, and seats inviting contemplative visits. On watching a prospective fish dinner, see X. Lafon, "Piscinae et pisciculture," 580–81; Littlewood, "Ancient Literary Evidence."

skiffs, so distant it was from its surround.[52] Inside, servants likely inched along narrow cavern walkways, but the elite in their silken draperies must have poled to this island, the sculpture, and inner cavern, as would those servants hauling dining furniture and food. The elite also swam for pleasure to the dining platform and cavern ledges,[53] to splash in water like the pointy-eared baby satyrs (*panisci*) at the island's ornamental pool. These could have been ordered from Asia or Athens for any pool rim. The masonry phases correlate with how their exact cousins sank with a ship near Tunisian Mahdia, bringing art to Roman villa builders between 100 and 80 B.C. These inhabited the basin's three near sides,[54] playfully scooping up water or fish in outstretched overlapping hands.[55] On the far rim, a servant spouted water from his jug.[56] These playing babies mimic *deliciae* (toddlers kept as "pets" for banquets), who perhaps splashed in this basin.[57]

The sculptures make this an island landfall of generic Dionysiac ease. Then or later, Dionysiac masks made lamp sconces inside the side cavern so that fiery satyr eyes glowed out of the cave's gloom. Laughing satyrs and a Cyclops at a cave for dinner entertainment: that defines the comic satyr-play classic, Euripides' *Cyclop*s, known to Republican audiences.[58] The regal fantasies of the great houses of the first century B.C. in fresco and architectural forms are well known. This platform with enclosed pool imitated the amenities of royal Sicilian yachts,[59] such as the boat that Hiero of Syracuse gave to the Ptolemies. Its fake dining room grotto held sculpture and had its own *piscina*.

Above, visitors headed for prospect rooms and porches to take the moving air and look out to sea and down the tempting strand. Desire pulled them to descend, enter the

[52] Salza Prina Ricotti, "Roman Garden Triclinia," and "Forme speciale di triclini," *Cronache Pompeiane* 5: 102-49, esp. 143.

[53] Cf. Cicero, *Pro Caelio* 15.35, for a list of Baia's delights of *navigia*: sex, banquets, dance, and musical spectacles. Art in baths where because of scale or room function there was no swimming; see my "Culture and History," 13, note 52; Clarke, *The Houses of Roman Italy*, fig. 103, 187–88 with bibliog.; John R. Clarke, *Roman Black and White Figural Mosaics* (New York: New York University Press for the College Art Association of America, 1979); Strong, *Roman Art*, fig. 120, bibliog., 288, note 20.

[54] *Das Wrack* (as above, note 28) 18 f.; Ridgway, "Greek Antecedents of Garden Sculpture," 14–15; Weis, "Odysseus at Sperlonga." Andreae noted the similarity. I am interested in synchrony. Cf. *impluvium* pools as decorated since the 1st century B.C.: Michele George, "Elements of the Peristyle in Campanian *Atria*," *Journal of Roman Archaeology* 11 (1998): 82–100, esp. 88 f., 94, 97.

[55] Cf. the wine bowl (crater) buried by an Augustan officer on the Rhine frontier: Toddlers (*deliciae*) clamber in acanthus as if in rock pools and seaweed, spearing enormous shrimps, fishing with rods; eels and snaky fish curl by. See Paul Zanker, *The Power of Images in the Age of Augustus* (Ann Arbor: University of Michigan Press, 1988), fig. 144, detail fig. 255, bibliog., 364.

[56] Standardized ornament; Neudecker, "The Roman Villa as a Locus of Art Collections," 85, fig. 7.14, 16.

[57] Cf. Tiberius inhabiting Augustus's villas at Capri: Servants dressed as maenads and satyrs attended grotto picnickers (Suetonius, *Tiberius* 43). Guests swam with *deliciae* labeled *minnows*. Suetonius fantasized that they nibbled adults lasciviously.

[58] Cf. ambushed Silenos's numinous yet comic cave in Vergil's 6th *Eclogue*. Mime: Horace, *Satires* 1.5.63, *Cyclopa saltare.* Pliny, *HN* 35.74, praised Timanthes' comic painting. Scylla mimes: note 74.

[59] X. Lafon, "Piscinae et pisciculture," 577. Deck pavilions from which the captain or steersmen kept watch over the course: *Das Wrack* (as above, note 28), 77.

water, and glimpse the *spelunca* hidden underfoot.[60] The savored vista included motion in water: boats, fishers, and even swimmers. Augustus patronized a painter of these spectacles.[61] Those arriving by boat saw the cavern prospect, elegant porticoed spaces embracing it, and passed the improved lagoon leading back into the cave. It was possible to bathe, before ascending the cliff, or remain below if on a short visit or enfeebled by age or drink. Augustus further monumentalized the contours, rounding out the cavern pool beyond the rectangular *piscina*. So both approaches by land and sea proffered a miniaturized version of those fine city harbors Augustus constructed.[62] The conscious pleasure taken in such sites is illustrated in those fantasies that enter Augustan landscape fresco,[63] as at what may be Villa Farnesina, the urban villa of his admiral Agrippa. Prefigured in second-century B.C. floor mosaics,[64] often decorating the *villae maritimae* they celebrate, such frescoes depict breakwaters and promontories elaborated with porticoes and sculpture, embracing sheltered waters. Frequently, a lower corner's natural rock and tree make it necessary to cruise a villa coast between its wild and elaborated sections. Harbors have a foreground mole, villas throw out island projections with people on them, and boats pass by. It appeared just so from Sperlonga's islet.[65] From above, the pavilion would have seemed like a pleasure boat entering the harbor under colored awnings (*vela*). All the more delicious then to pole into this lagoon to see an almost wrecked ship. Some later emperor elaborated on this harbor fantasy with the profile of Jason's ship, the *Argo*, carved into the cliff as if it had eased into the lagoon.[66]

[60] A watery version of *villae urbanae*, whose approach was a mirror image of the urban *domus*, through garden court to atrium. See Andrew Wallace-Hadrill, "The Villa as Cultural Symbol," in *The Roman Villa* (as above, note 50), on *impluvium* decoration. Augustus's Palatine *domus* was a prospect villa, over two mythic caverns (Cacus's and Lupercal), from their level ascent via (46) the Stairs of Cacus.

[61] Studius (Ludius), Pliny, *HN* 35.116; Roger Ling, *Roman Painting* (New York: Cambridge University Press, 1991), 142–49; Bergmann, "Painted Perspectives."

[62] Cf. the promontory palace at Caesarea of Augustus's friend Herod, a Roman villa maritima with enclosed *piscina*: Kathryn L. Gleason et al., "The Promontory Palace at Caesarea Maritima: Preliminary Evidence for Herod's *Praetorium*," *Journal of Roman Archaeology* 11 (1998): 23–52, esp. 23 f., 35–39, on the pools of all Herod's garden palaces; (25) this *praetorium* (*Acts* 23: 35) compares well to *praetorium speluncae*.

[63] *La villa della Farnesina in Palazzo Massimo alle Terme*, ed. M. R. Sanzi di Mino (Milan: Electa, 1998). Shore scenes lining halls *F* and *G* (pls. 138–47) suggest campaigns and harbor buildings of Augustus and Agrippa: *G* (pl. 143), sea battle, defeated soldiers swimming toward besieged tower; *F* (pl. 141), ship sailing to river bridge, happy fishers guarded by Neptune statue on a crag, foot up on a *rostrum*—later typical but in this formative period suggesting Octavian's victory coins.

[64] Cf. fragmentary cove scenes in mosaic: ca. 150 B.C., fishers and their tackle from Priverno (Rome, Museo Nazionale); fragment from Praeneste's "Cave of the Lots," fish laid on a strand. M. R. Sanzi di Mino, "Pavimentazione a Roma e nel Lazio," *Roma repubblicana dall' 270 A.C. all'età Augustea* (Rome: Quasar, 1987), 48–63, esp. 60–61, figs. 14, 15.

[65] For fundamental exposition and contextualization of the thematics of images about harbors, shore, and sea, see Bergmann, "Painted Perspectives," 49–69. This essay is steeped in hers.

[66] A mosaic inscription explained the ship's nondescript profile.

Time for Dinner 2

Houses at Pompeii, which at the eruption of Vesuvius in A.D. 79 retained superb earlier programs, show the prestige of heirloom art and architecture. Augustus left the dining island intact. Expanding the lagoon's habitability, mosaic, fresco, stucco, and artificial encrustations formalized a salon in the newly regularized innermost fissure. The cranny beside the outer pool was also slightly altered. All this framed new, hyperrealist marble sculptures at the cave: Homeric spectacles of combat, courage, horror, and suspense. The pleasure motions of boating and swimming are evidenced by the inner suite and this new high art installation, which was placed carefully for vistas from the dining island but also demanded closer inspection. The idea of story sculpture exploiting a cave setting was not new, and if the first decorations included a Cyclops, Augustus had a Homeric theme he could expand. Tourists to Smyrna and its Homereion came to the bard's famed water cave by the flowing source of the Meles River, his father, where he had sat composing.[67] Now Augustus's water cave at its planted porticoes brought into vision the stories that had flowed from blind Homer's mouth (cf. Silenus singing of Scylla in his cave).[68] The city and its culture are evoked in these elaborate images, as is the Mediterranean expanse by its Rhodian workshop. Their difficult transport to this water garden must have teased the admiring imagination.[69]

Sperlonga finds in the 1950s revolutionized Greco-Roman art history because Scylla was signed by the Rhodian artists to whom Pliny (*HN* 35.37) ascribed the *Laocoön*, proving that the statue is not a Hellenistic Greek original (Athanadoros, Hagesandros, and Polydoros). In cave cranny and in the water were enacted near-death moments suffered by Odysseus in the *Iliad* and *Odyssey* (Figs. 3–5). Episodes were chosen so that, by eye or motion, the series made the viewer sail a course at once geographic and temporal—to Asia, then back to Italy, and from the *Iliad*'s moments before the fall of Troy to its aftermath in the *Odyssey*. Closest to the island, the shaped foreground spits at the cave's mouth made Troy's Asian seacoast and river plain, where Odysseus contended with his Roman viewers' Trojan ancestors. At left, he glared around an implied battle melee, rescuing the corpse of a young companion.[70] At

[67] Homer was mothered by a nymph and was born at riverside. Pausanias, 7.12–13, names this *spelaion* among (7.6.1) Ionia's marvels, *thaumata*; just before (7.10–12) he lists Ionia's *loutra*, natural baths in the rocks. Some were Homeric (with sculptures?), e.g., Klazomenai's "baths" of Agamemnon.

[68] Vergil, *Eclogue* 6.74-77.

[69] I agree with those who wrote that they were carved in Italy with knowledge of the site, bravura inventions in marble from no matter what influences. In their master canon of archaic through early 3d-century Greek art, neither Pliny nor Pausanias knew of sculpture about Odysseus. Shipping and assembling was formidable, whether from Rome or temporary workshops at Puteoli or Baia. Plantings, cf. irrigation pits: W. Jashemski and E. Salza Prina Ricotti, "Preliminary Excavations in the Gardens of Hadrian's Villa: The Canopus Area and the Piazza d'Oro," *American Journal of Archaeology* 96 (1992): 592, fig. 16.

[70] An established Hellenistic composition, Pasquino group: an erect warrior braces a dead one's limp body. Scholars puzzle over ours (see Weis, "Odysseus at Sperlonga") as Aeneas, (Green *contra*), since he has a specific ornamented helmet of Phrygian or Thracian type. I do not believe viewers labored to examine helmet details; rather, when bearded Odysseus led three other groups, this too seemed to be Odysseus.

right he moved with equal agitation through the Trojan lines by night with his friend Diomedes, whose hand clutches the Palladium (see Fig. 4). They had just stolen it from Troy's citadel to deprive the city of its guardian token and guarantee its fall.[71] At evening banquets, the lighted villa above might have seemed like Troy's acropolis.

Further within the cavern's water and across it lie Sicily and Italy, where geographers place the scenery. At the back is Polyphemus's cave, as if it were possible to see magically into the blocked cavern of the narrative: The giant, with the wineskin holder lunged away, lies asleep from the effects of the wine used to distract him from eating Odysseus's companions; meanwhile Odysseus is leading the company to plunge a stake into his eye (see Fig. 3).[72] The pool centerpiece is where Odysseus's ship struggled past Scylla, whose echoing *spelunca* guarded the straits of Rhegion and Messana (see Fig. 5). Here guests bypassed her to reach the inner salon, which was set into a round basin, floored and rimmed by colored marbles and edged with mosaic inlay.[73] She pulled the helmsman from the boat, as her sea-dog lower limbs strangled and devoured victims. Odysseus brandished a spear and in response she seemed to move her head. Like his trick on the Cyclops, the distraction was successful, and the boat escaped with the survivors of this other homophagous feast.

The images delineate desperate and dangerous water journey and landfall. Yet they invite the water motions they ironize for those swimming and punting between inner suite and dining island around the images. Guests must have wanted to inspect these baroque masterworks and look closely into the convulsed faces of Scylla's victims. How difficult it must have been to resist clambering amidst the marble men and over the inert giant, a group that mocks both bad hosts and guests, and adding a hand to the shaft about to blind the man-eater, as other diners applauded. Visitors swam or punted back to the dining couches in burlesque of Odysseus's own escape.[74] Selecting or even spearing the ornamental fish for dinner, they could mimic the ravenous "fishlady" munching men.[75]

[71] On this version, 29. The smiling Minerva/Pallas Athena, archaic style signaling its antiquity, had a shield on one arm, the other raised to strike with an attached metal spear. In the warrior's arms the combative stance ironizes the image's helplessness, a cruel pun on conventional rape groups. Yet her spear *will* land; she *will* torment these two *and* their comrades, for Cassandra's rape at Pallas's identically posed cult statue, and Trojan descendants *will* conquer Greece. De Grummond, "Gauls and Giants," suggests, without parallels, Diomedes handing the Palladium to Aeneas, to fit Weis's Italian "Aeneas and Lausus." No viewer could read the clutching rape pose with its agitated stances as anything but the theft.

[72] Missing the great marble or metal cup standard in related wine-drinking groups. Dropped from Cyclops's nerveless hand, it lay at the niche's edge.

[73] Cf. Ridgway, "The Sperlonga Sculptures," 87, note 2: "The total effect would then have seemed less natural and wild in antiquity than it appears today, when the artificial decoration is largely lost."

[74] Romans relished 5th-century Athenian dramas where (Aristotle, *Poetics* [Loeb ed.] 145a, 146b) "[A]ctors think the audience do not understand unless they put in something of their own, and so they strike all sorts of attitudes, as [when] . . . mauling the leader of the chorus when they are playing the Scylla." Cyclops mimes, 17.

[75] One re-creation (Pliny, *HN* 9.77) is Vedius Pollio's tossing of "bad" servants into his pools of trained eels, who were maddened by vinegar that had been added to the water, thereby causing them to devour the servants. This perversion fits the harmful opulence (Ovid, *Fasti* 6.643–44) for which Augustus razed Vedius's Palatine mansion when it was bequeathed to him in 15 B.C. However, he accepted Pollio's villa at Pausilypon near Naples; its *piscina* may have showcased this carnage.

3. (above) Odysseus and his men blinding the Cyclops Polyphemus, seen from the back of the cave (courtesy of the Sperlonga Museum; reconstruction by B. Conticello)
4. (left) The Palladium in the Hand of Diomedes *(fragment, height 82 cm; courtesy of the Sperlonga Museum). This grouping of Odysseus and Diomedes stealing the Palladium at Troy is viewed from the front of the cave.*
5. (below) Odysseus's ship menaced by Scylla (courtesy of the Sperlonga Museum; reconstruction by B. Conticello)

Laughter, food, then sex: No evidence indicates that this had been a cultic site, but Augustus emphasized the aura of antiquity already set by the Dionysiac frame, as if this were the habitation of water beings born long before the human race and a site honored by visiting humans in primitive votive forms. The inner cavern's mask sconces imitated the votives of caves where Pan and nymphs were worshiped at water sources. The rows of rough little niches laid into the entrance walls of the main cavern and the cave fissure beside the pool must have been meant for artificial images of little rustic ex-votos, such as that in the sophisticated villa grotto painted in the landscape salon from Boscoreale.[76] The epic core evokes that much-visited nymphs' cave at Ithaca, where Odysseus finally landed after ten years away. The inner suite's display niches also tagged it as an Odyssean idyllic cave, a *specus amoenus.* This might further develop the Ithacan *nymphaeum*,[77] or it could be the cave of Odysseus's year-long amorous idyll with the salvific nymph Calypso.[78] Asserting that this *was* a site where nymphs came gave female banqueters someone besides Scylla with whom to resonate. Idyllic caverns were where sea nymphs loved to cruise into shore to banquet and rest like the Roman elites who cruised the maritime villa landscape and imaginatively shared their movement and space. Women embodied nymphs' forms,[79] and men were invited to erotic quest of those nymphs, like Peleus surprising Thetis in her cavern bedroom.[80] Bathing in mixed company invited an erotic mood, and secluded crannies were

[76] On earlier, much-visited Greek grotto reliefs and votive niches, see Ridgway, "Greek Antecedents of Garden Sculpture." On Republican eclectic versions of Greek votive plaques with Pan and nymphs, cf. Pollitt, *Art in the Hellenistic Age*, 178, fig. 189 (note the deliberately clunky Greek votive inscription). Ovid, *Ars amatoria* 71–72: Livia's portico decorated with *priscis tabellis* and "ancient-style [votive] tablets." On Boscoreale, see my "Looking outside Inside," 18–20, esp. 20. Note the carefully primitive archaistic style of the marble wall relief from Sperlonga, of the Julians' Venus Genetrix: Weis, "Odysseus at Sperlonga," 132, fig. 64. On pseudo-antique reliefs and their images in Roman houses, see Bettina Bergmann, "Exploring the Grove: Pastoral Space on Roman Walls," in *The Pastoral Landscape*, ed. John Dixon Hunt (Washington, D.C.: National Gallery of Art, 1992), 21–48, esp. 36, 45, note 27 (1995) 103–4; see *Das Wrack* (as above, note 28), 19 ff., on shipping real antique reliefs from sanctuaries.

[77] Odysseus stowed the tripods the Phaeacians had given him here, and Augustan commemorative arts often stressed tripods of Augustus's patron, Apollo. If metal versions of these tripods were propped anywhere here, they provided a felicitous Augustan resonance.

[78] Previously, Pompey's Portico, a painted Calypso seated at her grotto with her lover or gazing at his embarcation (Pliny, *HN* 35.132). Its painter Nikias also did the famous *Visit of Odysseus to the Underworld.* Irene also painted Calypso: *HN* 35.137; Pamphilos painted Odysseus on the raft Calypso gave him: *HN* 35.36. Cf. Nikias's triad of watery heroines (a unitary display at Rome?): *Calypso and Io and Andromeda.* His *Danae* (*HN* 35.131), dedicated by Tiberius, perhaps showed her at seaside with her ark.

[79] This is why the Cyclops in Roman art and erotic poetry invites Galatea to drive her dolphin to his cave and Propertius so suspected his Cynthia's trips to Baia's seashore grottoes. See Andrew Riggsby, "'Private' and 'Public' in Roman Culture: The Case of the *Cubiculum*," in *Journal of Roman Archaeology* 10 (1997): 36–56, on rooms where patrons had few or no slaves present. *Cubicula* (46–77) hosted informal dress and speech and sexual intimacy, and invited suspicions of libidinous behavior, as did public baths, predicated by undress and the slippage between class and gender lines. The sensuality of immersion must have influenced this.

[80] Thetis's villa (Ovid, *Metamorphoses* 11.229) has been adduced before for format. Thetis always came naked on her dolphin; here Peleus jumped her. Catullus had made Peleus and Thetis a core exemplum for a Roman noble couple in his influential marriage hymn (64). The embroidered bedcover supplies the other exemplum of seashore betrayal: Theseus stealing from Ariadne by ship, her lament to the waves about their voyage together, and then lovestruck Dionysos's arrival.

suggestive. Ovid wrote of Circe, in a love triangle initiated when the haughty girl was caught skinny-dipping, inflicting her monstrous form on Scylla at Scylla's favorite grotto.[81] Hauled back among dressed company by the grinning satyr children, a male swimmer might have been teased like a salt-crusted Odysseus, surprised in his waterside sleeping shrubbery, veiling his private parts from Princess Nausicaa and her maidens.[82]

Marble for Water

Ovid (*Metamorphoses* 4.550–62) addresses how any ambitious Augustan *dominus* might scatter the protagonists of painful sea stories at cliff and shore for aesthetic delight, and self-conscious sympathy of visitors makes us view a marble group of Ino's weeping women, petrified in wailing after Ino leapt into the sea, a *monimentum* of Juno's anger. Throughout the centuries, this iconic water garden was savored for staging epic water journeys where its great patrons impersonated a range of mythic heroes and for entering Rome's Trojan past. Though the villa's sculpture fragments are not completely catalogued, they document efforts to harmonize with the central marble epic, for more images postulate famous seas and lands and stories of bestial assault, heroic endeavor, and erotic adventure. Near the cave mouth, Ganymede hung crying in the talons of the enamored eagle Jove, as if the cliff over the Troy spits were Mount Ida. Part of the cave mouth crumbled upon the banqueting Tiberius. If that had been the front instead of the back salon, Ganymede might have been installed in thanks for Tiberius's delivery, rescued by Rome's Jove.[83] For another bestial assault, Andromeda was bound half-naked on her sea crag, perpetually awaiting the devour-

[81] This story couples Cyclops with the nude Scylla wading at her cave. She is metamorphosed by a jealous Circe, who longs for the same fisherman lover and poisons the water (Ovid, *Metamorphoses* 13.51–71, 725–903). On this man-eater's erotic aura, see Elena Walter-Karydi, "Dangerous Is Beautiful: The Elemental Quality of a Hellenistic Scylla," in *Regional Schools in Hellenistic Sculpture*, ed. Olga Palagia and William Coulson (Oxford: Oxbow Books, 1998), 271–83. Cf. the pleasing rococo sculptures of the collection of Augustus's friend Asinius Pollio, which he gave to the portico of Octavia (Pliny, *HN* 36.33), including *Oceanus* and *Appiades* (Pliny, *HN* 35.114). The "noble" Hesione painting perhaps showed her rescue from a sea monster. The complex already had the *Bathing Venus of Doidalsas*, *HN* 36.35, and several standing Venuses undoubtedly bathed too.

[82] On the sexiness of such places, see Alfred Frazer, "The Roman Villa and the Pastoral Ideal," in *The Pastoral Landscape* (as above, note 75), 49–61. Evoking Theocritus, he writes that the shell-coated grotto of Formiae's Villa of Cicero "is an erotic vessel waiting to be filled" (54); in comments (52–53) on Theocritus, *Idyll* 22, the monstrous, murderous boxer King Amycus caught basking in a sacro-idyllic landscape (cf. 11, Ficoroni Cist); cf. our cave's "aberrant version of the theme of *et in Arcadia ego.*"

[83] Polychrome marble. For the exemplar by Leochares in the gardens of Pompey's portico, see my "Culture and History," 347; Weis, "Odysseus at Sperlonga," 132, fig. 63 (Andreae's Augustan date); *LIMC* 4 (1988), 154–69 s.v. (Sichtermann); Neudecker, *Skulpturenausstattung*, 233, Flavian, setting it in the niche to the right of the cave's mouth; Kunze, "Zur Datierung des Laokoon," 153 note 34. For herm of a youth in Phrygian cap, called by Andreae Ascanius, see Weis, "Odysseus at Sperlonga," 125; Martin Spannagel, *Exemplaria Principis: Untersuchungen zu Entstehung und Ausstatung des Augustusforums* (Heidelberg: Archäologie und Geschichte, 1999), 100, pl. 11. It could be Attis or Ganymede.

ing *cetos* to emerge from the waves, white flesh rigid with fear, unaware of Perseus's imminent salvific arrival from the sky.[84] (The *piscina* label *cetarium* playfully adduces inhabitation by such a sea dragon.) The terrain helped instantiate the myth. Surely she too was fixed to real rock over water. A traveler to the Levant or any well-read Roman knew that Jaffa's sea crag was still marked by her chains, the seaside spring still red with the blood cleaned from Perseus's blade.[85] In 58 B.C. Marcus Scaurus had fetched the sea monster's bones to Rome.[86]

Augustus's family at a later villa at Boscotrecase commissioned now-famous pendant frescoes of Polyphemus and Andromeda on sea-girt rocks. These delicately eroticized fantasies also evoke Roman landmarks of eastern and western sea voyages, perhaps even echo Sperlonga's conceits[87] by affording optical voyage between Asia and Hesperia. Moving into

[84] Andromeda/Hesione: Neudecker, *Skulpturenausstattung*, 222 note 62.27; Weis, "Odysseus at Sperlonga," 133, Flavian. My comparison is from Euripides' *Andromeda* (frag. 125 Nauck); Aratus in the *Phainomena* beloved of Republican and Augustan (court) readers, makes her a sculpture. See M. Possanza, *Bryn Mawr Classical Review* 99.09.07, review of Douglas Kidd, ed., *Aratus: Phaenomena* (New York: Cambridge University Press, 1997). For Roman versions of Nikias's *Perseus Unchaining Andromeda* (Pliny, *HN* 35.40.132), see Bergmann, "Greek Masterpieces," 79–107, esp. 95–96, fig. 6. All others posited the similarly chained Hesione for a Troy theme but she barely appears in Greco-Roman art and literature (*contra* cf. note 81). Whenever they did, Andromeda and Ganymede made witty antitheses about danger and desire, both loved by magical flyers, threatened by *monstra* like Odysseus's companions below. Dinner: Ganymede was headed for a career as divine cupbearer, and Andromeda was intended for the *cetus*'s dinner.

[85] The Flavian Josephus, *Bellum Judaicum* 3.419–20, describes this treat for an eastern periplus. The text is based on early writers like Poseidonius with whom Roman audiences were familiar. From Caesarea nearby, Herod must have shown it to visiting Roman allies. Pausanias, 4.35.9, notes Perseus's spring: "Red water, in color like blood . . . close to the sea [like Sperlonga], and the account that the natives give of the spring is that Perseus, after destroying the sea-monster . . . washed off the blood in the spring."

[86] Pliny, *HN* 9.11: "Marcus Scaurus as aedile exhibited, among other miraculous remains, the bones of the water beast to which Andromeda is said to have been exposed, shipped to Rome from the Judaean town of Jaffa—40 feet long, higher than an Indian elephant, its backbone six spans thick"; see also Solinus, 34.2. Augustus probably acquired these *reliqua miracula* for his garden museum at Capri; see Suetonius, *Augustus* 92: "[T]he extraordinarily great pieces of sea and land beasts (*belvae* and *ferae*), what they call 'giants' bones,' and the arms of heroes." On both passages, see Bodel, "Monumental Villas," 19. Cf. our compellingly real reconstruction of mythical monsters; both make fantasized gameparks.

[87] An almost certain imitation was Pytheos's silver banquet display dish priced at 10,000 *denarii* (Pliny, *HN* 34.157): Its central *emblema* was Odysseus and Diomedes stealing the Palladium. All note that including Odysseus in the theft narrative was unusual. Only an ossuary from Antonine Turkey is extant (Weis, "Odysseus at Sperlonga," 123, fig. 47). However, the project about *virtus* on the Megiste Ostothek is borne out by how the rest of the marble box has heroic, national imagery (e.g, Victory and the Shield from imperial iconography). Stewart, "To Entertain an Emperor," 80, adduces 3d-style (Augustan) mythological paintings. Each pair (Troy and voyage; *Iliad* and *Odyssey*) is like the two-step narrative invented for this fresco genre; see Peter von Blanckenhagen and Christine Alexander, *The Augustan Villa at Boscotrecase* (Mainz am Rhein: von Zabern, 1990). The murals at Boscotrecase, associated with Julia's son, Augustus's grandson Agrippa Postumus, seem to have been painted in the first decade B.C.or the first decade A.D.; von Blanckenhagen and Alexander, *The Augustan Villa*. Polyphemus tends goats as Galatea swims, and in the background he hurls rocks at Odysseus's fleeing ship. Perseus and the sea monster converge on Andromeda, and at his palace Perseus clasps hands with her father Cepheus in the background.

the later empire, the *Argo* carved to the left of the cave sought Circe's palace at nearby Circei or rested on its voyage back east from her island.[88] Visiting here was still a privilege. Book in hand, an admiring later visitor made the owner an Ovidian epigram to be carved onto the ship. The late antique Faustinus "vergilianized" the cave with a ten-line poem on a marble plaque.[89] Another elite visitor of the fourth century A.D. was the owner of the villa of Piazza Armerina in Sicily. In imitation of feasts that still likely were being staged at Sperlonga, he turned one apsidal room into a mosaic version of Polyphemus's drinking bout and the apse floor into a cave arch. The Church fathers exploited Scylla and Odysseus's oceanic travails as parables at least to the fifth century. Christian connoisseurs made sculptures on this model for their own favorite myth of salvation from marine monsters and shipwreck. From the Sperlonga Scylla, they borrowed the motifs of the victims around her waist for their marble Jonah, who was swallowed and then regurgitated by his "sea dragon," the whale.[90]

What was the artistic context for these conceptions? For the first century B.C., the maritime villa zone supplied numinous and lighthearted sea images of Neptune and his tritons and nereids.[91] They governed pools and caves, like Capri's Blue Grotto and another court villa.[92] All such commissions playfully translated triumphalist display at Rome. For the Temple of Neptune,[93] sometime between 120 and 90 B.C., a Republican admiral ordered a fabulous marble sea *thiasos* that cast him as its Achilles being brought by Thetis and

[88] After Apollonius's Hellenistic *Argonautica*, a plot read intensely at Rome; the Argonauts took her salvific advice before returning east. Strabo, 5.2.6: The island of Aethalia, which is en route to Volaterrae, has an Argo beach because Jason disembarked when Medea visited Kirke. Its beach pebbles are congealed from the oil and sweat of the Argonauts' strigils.

[89] Weis, "Odysseus at Sperlonga," 126–27, 140–42, 164–65. On Faustinus, see Green, "Pergamon and Sperlonga," 181–82, marble plaque, and Weis, "Sperlonga and Hellenistic Sculpture," 418; Stewart, "To Entertain an Emperor," 78; Weis, "Odysseus at Sperlonga," 133; De Grummond, "Gauls and Giants," 271, Argo inscription.

[90] For Jonah cycle contexts in 2d- and 3d-century images of maritime life, see Sichtermann (241–48) and Brandenburg (249–56), *Spätantike und frühes Christentum: Ausstellung im Liebieghaus, Museum Alter Plastik, Frankfurt am Main: 16 Dezember 1983 bis 11 März 1984* (Frankfurt: Das Liebieghaus, 1983), also 258, 612–23. A wonderful *nymphaeum* sculpture set (Cleveland Museum: Cornelius Vermeule, *Greek and Roman Sculpture in America* [Berkeley: University of California Press, 1981], color pl. 18, 224–29, cat. no. 189) amasses Jonah swallowed, spat out (cf. sarcophagus with ship: Strong, *Roman Art*, fig. 219), sleeping under the gourd vine, and rejoicing with portraits of the patron couple.

[91] Mimicked as painted immersion in a little-known (lost) water hall, ca. 45–30 B.C., Villa of Diomedes (Pompeii). Lifesize tritons and nereids (Galatea story?) disported around blue walls. Room 5, a sunken salon off the atrium, was distinguished by its staircase as a fictive grotto. A. and M. De Vos, *Pompei Ercolano Stabia*, 2d ed. (Bari: Laterza, 1988), 243, 244 (plan). The villa was built for sea views. See Mielsch, *Villa romana*, 40–41, 147.

[92] At the natural and excavated cavern *piscinae* at Sorrento for the Augustan Prince Agrippa Postumus (cf. Boscotrecase, as above, note 86), a cupola with sculpture niches lit an underground pool (Room *H*), which was reached by boat (cf. Cumae, note 45); Mielsch, *Villa romana*, 119–20, fig. 86. Cf. Strong, *Roman Art*, fig. 219 (*PECS*, s.v.), Baia, Republican or Augustan Temple of Mercury. The enormous rotunda built into the hill had sculpture niches, an *oculus*, and upper windows, with pendant *nymphaea* on its axis. A later water hall was excavated leading from it.

[93] *LTUR* 3 (1996), s.vv. "Neptuni aedes in Circo" and "in Campo" (A. Viscogliosi).

her nereids, riding to Troy over sea from Vulcan's Sicilian workshop. Thetis must have held Homer's fabulous shield, which mapped Earth within Ocean.[94] For his victories over Mithridates, Pompey erected for Venus Victrix two masterpiece Europas, each rapt over Ocean on her lustful Jupiter-bull, signifying Europe's conquest of Asia. Importantly for Sperlonga's public veneer, Odyssey sculpture existed in the same garden portico, ca. 55 to 52 B.C.[95] Augustan poetry praised this fountain group of the Thessalian King Maro, also a priest, drunk with the same potent wine that the Cyclops drank.[96] Sicily's monuments already showed famous Odyssean displays, surely to inspire Pompey and Augustus. Messana's Scylla overlooked her own straits. Hiero's admired palace at Syracuse set up Odysseus and his men using Polyphemus's rams to escape the Sicilian cave.[97] By early first century B.C., private mansions in Italy displayed epic groups, some in marble from the east.[98]

Sperlonga thus has a public, nationalist context. Competing with earlier outstanding public and private displays, it distinctively combines a real situational terrain, ambitious multifigure complexity, and multiple episodes about one protagonist, which makes it different from anything previously known. Sperlonga is said to instantiate those "wanderings of Ulysses in places" that Vitruvius writes were favored for house frescoes and to echo the *Iliad* mosaics of Hiero's Syracusan yacht. Those were assigned a moral aim to instill courage in soldier-voyagers.[99] The Sperlonga sculptures have been missing from studies of Augustan political art in recent decades; yet no observer could have missed the visual and situational resemblance to exemplary catastrophe and quest stories, including water monsters at pools, that dominated Augustan commemorative at Rome after the civil wars.[100]

94 Pliny, *HN* 36.26; for bibliog., see my "Ara Domitii Ahenobarbi," 207. The patron and *hortus* owners who imitated his display resurrected Plato's Temple of Neptune at Atlantis, *Kritias*, 116, d–e: "[T]he God standing on a chariot and driving six winged horses, his own figure so tall as to touch the ridge of the roof, and round about him a hundred [n]ereids on dolphins." For similar frescoed private spaces, cf. the Thetis triad in the Domus Uboni (Room *N*, illus. in Richard Brilliant, *Visual Narrative*, 67); *LIMC* 6 (1992), s.v. "Nereid" VI no. 407; my "Ara Domitii Ahenobarbi," note 51.

95 Also Antiphilos's *Europa*: Pliny, *HN* 35.114.

96 Propertius, 2.32.14–16; See my "Culture and History," 356–57, noting Maro's *heroon* on a lake by a stream called Odysseon (Strabo, frag. 7.44–45) at the much-visited Thracian Maroneia. This resembles the Cyclops whose drunkenness Maro enabled, as he gave this wine to Odysseus, who in turn gave it to the Cyclops.

97 On the piglets found here, see Weis, "Odysseus at Sperlonga," 132, taken to represent bits of a group of the Lavinian sow or nymph dedications, but perhaps Circe. Rams are at other Sicilian sites also. Catania may have claimed the cave, which Hiero's palace then restaged. Surely, Sicily already had a cave with the Cyclops's nightmare banquet. See R. J. A. Wilson, *Sicily under the Roman Empire: The Making of a Roman Province, 36 B.C.–A.D. 535* (Warminster: Aris and Phillips, 1990), 19, and app. 2, 343 ff. Domitian added this escape episode at Castel Gandolfo.

98 See Ridgway, "The Sperlonga Sculptures," 85, terra-cottas near Tivoli and Chieti; Odysseus head, fig. 84 (Steingräber, "Pergamene Influences," 238, adding the Aachen Odysseus head, fig. 85); under-life-size Achilles and Odysseus (for Achilles' unmasking at Skyros? not *contra,* Ridgway "heroic scale"), Antikythera shipwreck, designed: Nikolaus Himmelmann, *Sperlonga: Die homerischen Gruppen*," 35, figs. 36–37, to be set against a wall as instant high relief.

99 This was the aim of the mural of the Argonauts Agrippa installed in the *saepta* (voting precinct), a pendant to the Caledonian boar hunt; *LTUR* s.vv. "Porticus Argonautorum" and "Porticus Meleagri."

100 At a major entrance to the forum (note 30, its naval trophies), Agrippa's bronze Hydra rose from the

Modern sensibilities cavil at choosing among lofty, erotic, and blackly humorous readings. Is this a monster park or a "freak show"?[101] But Roman house arts, like its literature, addressed a spectrum from the moral to the thrilling, to satisfy any mood of those living with such art for days or months. The qualities of thrilling spectacle and cultured content *could* generically illuminate Roman display. However, the hosts were emperors, and this grotto established the iconic decoration of an imperial villa. In imitation of the deified Augustus,[102] Claudius, Nero, Domitian, and Hadrian left replicas of the Polyphemus or Scylla groups in *nymphaea* at Baia,[103] the Palatine,[104] Castel Gandolfo,[105] and Tivoli. These emperors as well as Augustus must have believed the lagoon denoted Augustus's best qualities, since Romans held that a patron's communally directed private displays also delineated public character.[106]

For the Augustan period, Sperlonga's iconic status is matched by the replication of the *Laocoön* (Fig. 6), whose original was from the same workshop.[107] Bernard Andreae under-

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Lacus Servilia (*LTUR*, s.v.). The statue (statues if Hercules' was here) was about crushing the multiheaded monsters of civil conflict. It damningly re-created the earlier Sullan proscriptions (*LTUR*), when the heads of "legally" murdered Romans hung dripping at this pool. For other pain art (e.g., Danaids at the Temple of Apollo Palatinus), see most recently Karl Galinsky, 220–22; for Niobids on its doors, Propertius, 2.32; and at the Temple of Apollo, Sosianus, Pliny, *HN* 36.28. Cf. Niobid *tondi* from the Mahdia wreck (thus at the latest 80 B.C.): *Das Wrack* (as above, note 28), 336 f.

[101] Cf. fish surrounding the Scylla of Androkydes to Kyzikos. Writers who assembled anecdotes in the frame of dinner stories attributed this species catalogue to the painter's fondness for eating them (Plutarch, *Moralia* 665d; Athenaios 341A). On elite spending to display deformed people, not least for banquets, see Robert Garland, *The Eye of the Beholder: Deformity and Disability in the Greco-Roman World* (Ithaca, N.Y.: Cornell University Press, 1995), chap. 3. His images include the Cyclops.

[102] Even without masonry dates, this replication damns the Tiberian origin theses. Builders of any famous Roman dwelling were remembered. No successor wanted comparison to this problematic personage; similarly for the spread of Scylla and Cyclops replicas into the eastern Mediterranean in civic contexts. The anecdote of Tacitus, *Annales* 4.59, and Suetonius, *Tiberius* 39, are only about Tiberius using this place.

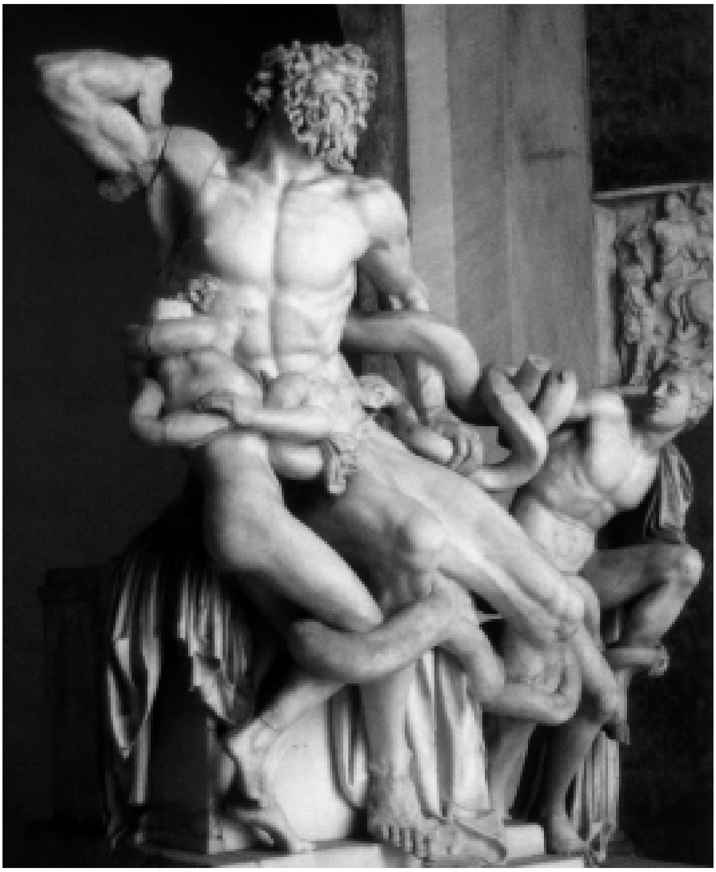
[103] See Andreae, *Praetorium Speluncae*, for bibliog. Claudian, this water-floored little "basilica" had the Cyclops at the end. Other images, including imperial portraits, were along the sides.

[104] Irene Iacopi, *Domus Aurea* (Milan: Electa, 1999), 13, figs. 11, 12: *nymphaeum* vaulted with fake rock (Room 45); central octagon *emblema*, glass mosaic of Ulysses offering Polyphemus the cup.

[105] *PECS*, s.v.; s.v. *Ulisse* (Ninfeo Bergantino); Neudecker, *Skulpturenausstattung*, 44–45. This grotto also has a large circular pool and several smaller side fissures. It had a Scylla and Polyphemus and his flock.

[106] T. P. Wiseman, "*Conspicui postes tectaque digna deo*: The Public Image of Aristocratic and Imperial Houses in the Late Republic and Early Empire," in *L'Urbs: Espace urbain et histoire* (Rome: Ecole Française de Rome, 1987), 393–413; for further bibliog., see Bodel, "Monumental Villas."

[107] Bodel, "Monumental Villas," 6: "[P]hysical structure served as a memorial to the man who had lived there"; (13) when it "combined with the cultic adoration of a great man, the result was an almost mystical reverence for the property," as with Augustus's other homes; see 18 f. on the status of whatever counted as prior owners' war memorials. This iconicity accounts for Sperlonga's careful preservation into the 4th century and probably beyond. An immense number of fragments did not weather or meet damage until systematically broken up; the way in which the pieces of our cycle were hurled into the pool (Andreae, *Praetorium Speluncae*, 56–57: monastery site) and not burned for lime implies the kind of ritually cleansing destruction, esp. decapitation and the deposit of heads as here, visited on other late antique villas by Christian owners in or after the Theodosian age. Cf. D. Vaquerizo Gil and J. R. Carillo Diaz-Pines, "The Roman Villa of El Ruedo (Aledinilla, Cordoba)," *Journal of Roman Archaeology* 8 (1995): 144, on the destruction of two water sculpture cycles (central



6. A much reproduced image from the classical world: Laocoön and his sons under attack by snakes (height 1.84 m; courtesy of the Vatican Museum, nos. 1059, 1064, 1067)

stood it as a nationalist exemplar, though Sperlonga's Odysseus was not read in that way.[108] Pliny (*HN* 36.37) praised the lost original in the reception area near the atrium of Titus's palace. In Renaissance Rome, fragmentary Laocoöns, from miniatures to larger than Sperlonga's, resurfaced.[109] The new Augustan date for Sperlonga confirms Andreae's thesis:

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court basin, Attis, son of the River Gallus); water dining room (134–37), the *Rescue of Andromeda*, *Hypnos* (they rightly compare Ovid's *Grotto of Sleep*). I add Ovid's *Salmacis*, a Hermaphrodite. Ambrose's anti-heretic Scylla metaphors for the Emperor Gratian adduce imperial *spelunca* (*De fide* 1.6.47).

[108] On Andreae's work, see Brunilde Ridgway, "Laokoon and the Foundation of Rome," *Journal of Roman Archaeology* 2 (1989): 171–81; and R. R. R. Smith, *Gnomon* 63 (1991): 351–58. Richard Brilliant, *My Laocoön: Alternative Claims in the Interpretation of Artworks* (Berkeley: University of California Press, 2000); Richard Neudecker, "Laokoongruppe," *Neue Pauly: Enzyklopädie der Antike*, vol. 6 (1999), 1135–37. Add Brunilde Ridgway, "The Farnese Bull (Punishment of Dirke) from the Baths of Caracalla: How Many Prototypes?" *Journal of Roman Archaeology* 12 (1999): 512–20; Pollitt, "The Phantom of a Rhodian School."

[109] On these replicas, see M. Koortbojian, "Pliny's *Laocoön*?" in *Antiquity and Its Interpreters*, ed. Alina Payne, Ann Kuttner, and Rebekah Smick (New York: Cambridge University Press, 2000), 199–216. On the nonidentity of ours with Pliny's, thus not Sperlonga's *atelier*, see Fred Albertson, "Pliny and the Vatican Laocoon," *Römische Mitteilungen* 100 (1993): 133–40. The head is located at or near the Augustan-era Baths of Agrippa, and the provenance of many is the bath or villa zone. One can list (a) the palace of Titus, Pliny, *HN* 36.37, and other images "in the atrium of Emperor Titus," *HN* 34.55; (b) Esquiline Baths of Trajan, now Belvedere,

like Vergil's, the carved Laocoön is gripping narrative, Augustus's special emblem for the historical *fata romana* through all travails, Rome's ultimate victory, imaged in the fall of that prophet, who would have averted Troy's ruin by stopping the entry of the Trojan Horse.[110] This workshop specialized in agonized, serpentine deaths descended from Pergamon's Great Altar. Sperlonga shares the Laocoön's portentous aura of exemplary myth-history. It nudges us to see the Laocoön as a water sculpture about water monsters, not just a parallel story tied to another device, the horse of wily Odysseus.

The place and moment, as Vergil *(Aeneid* 2.201–27) describes them, were when fantastically colored serpents rushed from the ocean to attack Laocoön as he was making a sacrifice to Neptune on his beach altar. Roman design habits suggest that it commanded a pool vista, so activating it implied a shoreline setting, whether in Augustus's palace or at the public water garden at the Campus Martius. Titus's *Laocoön* must have been imperial patrimony, since the Flavians restored nonimperial works Nero appropriated. The vestibule location signals that its patronage history was exemplary. Titus's *Laocoön* must have been Augustus's (if Pliny meant the Palatine atrium of any sitting emperor) or a programmatic replica of that site (if Pliny meant Titus's separate *domus*). Augustus's palace had an ostentatiously Republican atrium with an *impluvium* pool,[111] which perhaps the *Laocoön* governed.[112] So, apparently, the Primaporta Augustus was first glimpsed across the *impluvium* pool of his wife's villa,[113] as if striding out of the surf, Amor on a dolphin beside him, back from world conquests imaged on his cuirass.

Being Odysseus and Being Good

The *Aeneid* imitated Odysseus's wanderings past the caves of the Scylla and Cyclops. Sperlonga's Odysseus is carved like Vergil's protagonist, who exemplified *virtus* and *pietas*. Artists often focus on Odysseus's problematic roles. Ancient and modern writers alike ponder his ambiguous character and impute to him responsibility for his comrades' deaths.

Koortbojian, passim; (c–d) Esquiline, Baths of Titus(?), 204; (e) 206; (f) ruins of Agrippa's baths; (g) 207, under Santa Pudenziana, Esquiline(?); and (h) 206, under the Ospedale of S. Giovanni in Laterano; and (i) 215 n. 83.

110 Cf. Augustus's Actian monument in Sparta for another famous seer connected with a sea triumph. The monument appropriated a bronze *Agias*, who "by divining for Lysander captured the Athenian fleet at Aegospotami" (Pausanias, 3.11.5).

111 See my "Culture and History," 10, on Suetonius, *Augustus* 92.10.

112 See George, "Elements of the Peristyle," 85, on politicized tableaux in atria (Hercules and Persian). Apuleius's *Metamorphosis* (2.4) confirms that early imperial atria liked to showcase with real water exciting disasters (cf. note 54), here Actaeon at Diana's grotto, viewed at the entrance; Niall Slater, "Passion and Petrifaction: The Gaze in Apuleius," *Classical Philology* 93 (1998): 18–35.

113 Modern-day excavators have reconstructed the statue on a framed base at the far end of the atrium: "The first thing that would have met the gaze of a visitor entering the fauces . . . accentuated and framed by the columns around the impluvium." A. Klynne and P. Liljenstolpe, "Where to Put Augustus? A Note on the Placement of the Prima Porta Statue," *Journal of Roman Archaeology* 12 (1998): 121–28, esp. 125–26. The dolphin nosedives into the implied sands, as Augustus reaches Italy in the perpetual *adventus* from east and west imaged on his cuirass (my "Hellenistic Images of Spectacle," 118).

Previous readings of Sperlonga refer in abstracted and partial ways to Homeric Greek and Roman texts instead of addressing the autonomous visual discourse of this visual epic. Sperlonga emphasizes Odysseus's *virtus* and *pietas*, selfless courage, loyally taking the brunt of danger to rescue companions. Altering traditional compositions, the designers emphasized that Odysseus strives with all the *cura* possible for his companions' *salus*.[114] Such actions won a soldier the *corona civica* from the senate, which was displayed over Augustus's door for saving a nation. The exemplary value of this narrative for a *princeps* and *imperator* needs no explanation. The *Laocoön* shows how Augustus was interested in commissioning nationally iconic baroque sculpture that brought the heroic age alive to a world invaded from threatening seas. Startlingly, no scholar has commented on how in meaning and baroque multifigure style ours suggests the *virtus* and *pietas* images of Romulus and Aeneas in Augustus's Forum.[115]

This program also looks to the present and "our" Rome, and eventually to Augustus's home there. The connecting element is the Palladium, whose theft guaranteed Troy's "fortunate" fall when the first of the Julii led the Trojans to Italy, as Augustus's public sculpture at Rome reminded viewers. Supposedly, this sculpture, which Sperlonga's copied, was an amuletic *pignus imperii* (talisman of rule) hidden in Vesta's temple, which Aeneas, Augustus's ancestor, brought to Latium. Caesar erected a statue of this, which its lunging heroes recall. By 12 B.C., Augustus put up another replica at his house shrine to Vesta. His villa's little doll also suggested Augustus's urban palace where that icon was venerated.[116] Thus my points of departure and return are the ultimate narrative and geographic end of what we see.

The archaeological dating of ca. 30 B.C. and the marbles' iconography mean that they were probably erected after Augustus's first sea campaign. In 36 B.C., off this western Italian coast, Agrippa broke the fleets of the monster Sextus Pompey, whose Sicilian warships had almost starved Rome into submission. Sextus had minted coins of the famous Scylla statue, a marker to ships at Messana on the straits.[117] Long popular in Italy and Sicily, the *Cyclopeia*

[114] In Pliny and Pausanias, Hellenistic and Roman Odyssean subjects are the tricking of Achilles at Skyros: the quarrel with Ajax for Achilles' arms; Odysseus's part in maneuvering Philoctetes; and his role in the sacrifice of Iphigenia. He is usually not the protagonist. The Cyclops group eschews the standard tricky offering of wine. The brave leader improvises and wields a spear, a more manly trick. Odysseus is not in the standard Palladium theft. Odysseus in battle is not documented. Scylla: Single statues existed; little record of any prior imagery, none in texts and outside Italy, exists to delineate confrontation with the ship *contra* Andreae. See Weis, "Sperlonga and Hellensistic Scuplture," and "Odysseus at Sperlonga."

[115] E.g., not by M. Spannagel, *Exemplaria Principis*, or any author in *From Pergamon* (as above, note 40). See Weis, "Odysseus at Sperlonga," 125 f., on the problem of Odysseus.

[116] De Grummond, "Gauls and Giants," 269–70, understands localizing to Italy. Sperlonga is ignored in texts on Augustus's Palatine house cult of 12 B.C. and his Palladium statue, which may predate this Vesta cult.

[117] Proverbial already in Cicero's day; *Pro Sestio* 8.18 compares a debtor chased to the Maenian column by moneylenders to someone escaping shipwreck at this Scylla column, making for the safe harbor of the tribuneship. Analogy to piracy but not to Sextus has been made; Sextus's Sicilian coinage of 42–40 B.C., *RRC*, 511/3, a marine trophy, whose cuirass is like a Scylla body, her dog-fish head emerging from it; *RRC* 511/4, Scylla slinging a rudder, reverse: the lighthouse of Messana with its guardian Neptune. Bibliog. Spannagel, *Exemplaria Principis*, 215. This monument should be linked to the Syracusan Golden Age in the 3d century B.C. In this common type, Scylla flails with a torn-off rudder at unseen enemies as her dog heads snarl at prey. As

by Augustus's day was even danced as a mime.[118] But here the amusing banquet *emblema* embodies Ciceronian comparisons of predatory leaders to Sicilian Cyclops. Octavian had met Sextus on the harbor mole of Baia and dined at his own Misenum harbor on Sextus's ship when they made their earlier unsuccessful treaty (Velleius, 2.77). Coming from Rome's Naulochus trophies[119] to dine with Augustus, no one would have missed seeing in the *piscina* monsters[120] the taming and spoliation of both the Sicilian predator and his images.[121] Similarly, Augustus's rededication of the Portico of Pompey meant he publicly took over the Pompeys' proto-Cyclopean group of the salvific Maro. Because later replicas tended to the variant where Odysseus is offering the cup to the Cyclops, Augustus likely had a commemorative one at Rome. It could override the Sperlonga model as an icon on a par with the Laocoön. That a public Scylla also existed is suggested not only by its afterlife around the empire but also by its presence among the *spolia* that Constantine programmatically transferred to his new Rome.[122]

> You, Muses, refresh, re-create in Pierian cavern great Caesar, asking to end his labors, right as he returns to their forts his levies just now released.[123]

In 31 B.C. Augustus and Agrippa smashed the combined navies of Antony and Cleopatra

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Sextus used her, she is a guardian image of Sicily as indestructible and is able to devour any sea invasion. For Sextus's own Neptune persona, cf. Velleius, 2.77, and Florus, 2.18.4, on how he made much of his father Pompey's house: "At the Keels," "In Carinae" (cf. Pompey's own pirate triumphs). Cf. also the city of Scyllaceum, founded by Odysseus, on straits in happy proximity to the family's shore palace of Cassiodorus, *Ep.* 15.

118 See note 58.

119 On the Forum, which was dominated by the nude golden Octavian; upon a column decorated with anchors and *rostra*, rams of Sextus's fleet after Actium; on coins from 29 to 27 B.C. See Murray and Petsas, *Octavian's Campsite Memorial* (as above, note 30), 117, fig. 63. For Naulochus, Octavian invented the *corona rostrata* to reward his admiral Agrippa with a crown studded with ship beaks. Murray and Petsas are correct (72, note 78) that the Syracusan bronze Corinthian capitals for Agrippa's Pantheon (Pliny, *HN* 34.13) were cast from Sextus's rams.

120 Fish from the sea landed at his feet as he strolled the beach before dinner. See Suetonius, *Divus Augustus*, 97. Cf. the mad sea beast hunt after Actium and its 36 crocodiles in a flooded Circus Flaminius: Dio, 55.10.8.

121 On Augustus's stern reordering of Sicily, historicizing commemoratives there for Naulochus and their numismatic advertisement, see Wilson, *Sicily* (as above, note 98), cat. no. 104, 643, pl. 15.14; Walter Trillmich, in *Kaiser Augustus und die verlorene Republik: Eine Ausstellung im Martin-Gropius-Bau, Berlin, 7 Juni–14 August 1988* (Mainz am Rhein: von Zabern, 1988), 507–8, s.v. cat. no. 324, discussing Octavian's coins about his rostral column.

122 Sarah Bassett, "The Antiquities in the Hippodrome at Constantinople," *Dumbarton Oaks Papers* 45 (1991): 91; Kunze, "Zur Datierung des Laokoon," 189 note 175, with bibliog.; Weis, "Odysseus at Sperlonga," 117.

123 Horace, *Odes*, 3.4.21–24, 37–40, praying in the years after Actium for this Hercules-like emperor to visit him in the coastal as well as inland villa zones. Perhaps it was for his own accession that Nero moved Odysseus from an ancient multifigure group by Onatas at Olympia for display at Rome. On Greeks casting lots to combat Hector, see Pausanias, 5.25.8.

at Actium; that meaning accreted to our series even if it preceded Actium.[124] Inventing our stunning marble boat fight recalls the equally novel public spectacle Augustus made by flooding the Circus Maximus for miniaturized war galleys.[125] The omen for Naulochus was a self-delivered fish dinner at Augustus's villa, maybe this one. A well-omened disaster animated Augustus's sculpture group at Actium proper.[126]

> So pleasant, when the winds whip the waters on a great sea, / from the land to watch another man's great *labor*; not because it is a pleasure, to be relished, that anyone should suffer / but because it is soothing to make out what evils you yourself lack. / So pleasant, even, to watch the huge clashes of battle / ordered along the plains, with no share of your own in danger. / But nothing is sweeter than to hold, well fortified, / by the taught doctrines of the wise, *templa serena*; from which, look down, see any others, everywhere / wander, and looking for the road of life / fighting with cleverness, struggling with *nobilitas*, / night and day, with outstanding *labor* / trying to come out on the peaks of wealth and to govern affairs. (Lucretius, *De rerum natura* 2.1–8)

Odyssean trouble by sea, Iliadic battle by land: All the public references aided ironically in the soothing qualities of inhabitation here.[127] All the suspense leading to Augustus's naval victories and the tragic loss of Roman lives from all factions informed the first reactions to the Sperlonga series. It exposed inner motions it meant perennially to serve. *Otium* relaxed virtuously active citizens for further exertion. This spectacle of pain must have intended catharsis, replaying and yet distancing its viewers' travails in the fraught aftermath of civil war.[128] The Roman bath before dinner soothed both body and spirit, as did

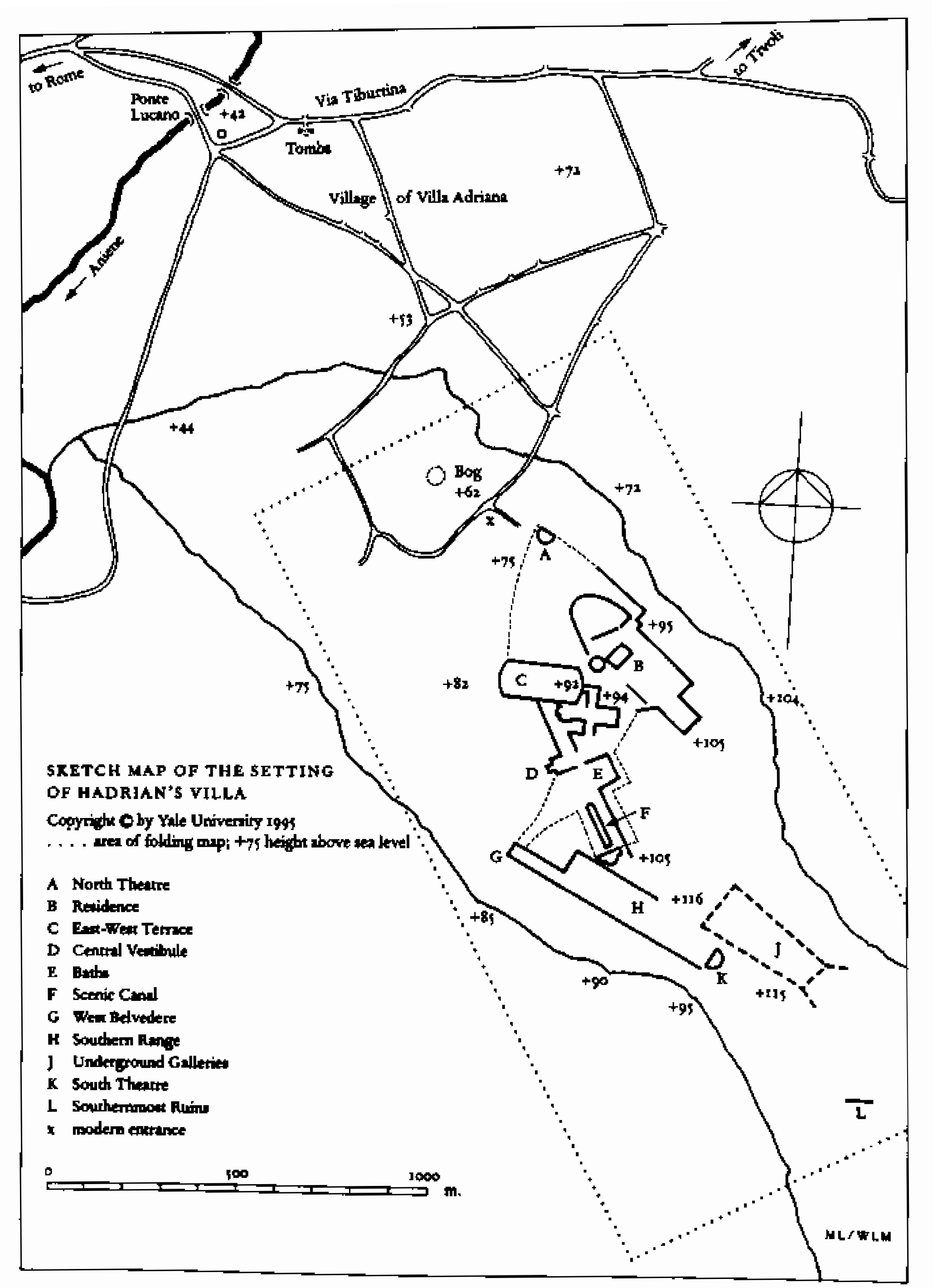
[124] Like reviewers for Robert Gurval, *Actium and Augustus: The Politics and Emotions of Civil War* (Ann Arbor: University of Michigan Press, 1995), I disbelieve that Augustus neither wished to stress his Actian victories nor associate his Apollo monuments with Naulochus or Actium. See James Clauss, *Bryn Mawr Classical Review* 96.9.7 [review]. Much Augustan pain art was created to mediate the aftermath of civil conflict in the 40s and 30s.

[125] Restaged at contemporary villas: in Horace, *Epodes* 1.18.61–64, Lollius and his brother made slaves handle the little boats; my "Hellenistic Images of Spectacle," 118; Kathleen Coleman, "Launching into History: Aquatic Displays in the Early Empire," *Journal of Roman Studies* 83 (1993): 49–50, 55–56, 72.

[126] At Nikopolis, which was founded so as to overlook the bay, Augustus put a bronze group of the portent met inspecting his ships beforehand: a man, Eutychos (Lucky), driving an ass, Nikon (Victor) (see Suetonius, *Divus Augustus* 96.2; Plutarch, *Antony* 65.3). Visual evidence shows that Eutychos fell at the emperor's feet; quoted in the reliefs on Trajan's Column is the pictogram of a man falling before the emperor. How meaningful this was is evident because this *monstrum* of the principate was hauled off by Constantine to Constantinople (Zonaras 10.30) after his 326 naval victory.

[127] For *Le tranquille dimore degli dei*, E. La Rocca quoted Lucretius, *De rerum natura* 3.17–23, about the gods' untroubled *sedes quietae* (sunlit abodes) as a historiated metaphor for the *hortus*. In Bk. 2's proem it is significant that humans are urged toward *templa serena*. The opening vista is in the language of elevated villa forms and prospects, including (after Homer, *Odyssey* 7.100–102, on the Phaeacian palace) watered and flowering gardens, to look after body and soul with pleasure, by streams and under trees (20–36 at 24–33).

[128] On staging visual spectacles of pain suffered by one's "good" contemporaries, see my "Hellenistic Images of Spectacle," 116; on Antony's display of Caesar's bloody robes and image, 111, *toga praetexta* drama. For the harbor imaged by the lagoon as metaphor for rest at seaside villas, see Bergmann, "Painted Perspec-



7. *Schematic plan of Hadrian's villa at Tivoli: Key (lower left) indicates* F *as the marker for the scenic canal discussed in text (from MacDonald and Pinto,* Hadrian's Villa and Its Legacy *[New Haven, Conn.: Yale University Press, 1995]; reproduced with permission of the authors)*

the cooling water pleasures of this marine dining room. The simultaneous immersion in strong emotion afforded by the visually delightful epic might have strengthened the well-being of survivors, who drank and laughed before these scarifying scenes.[129] Distancing turmoil in a mythic past likely assisted that process of memory and forgetting, turning history into the safely sequestered past so that the soul could survive. That identification and consolation were consummated by moving in this water. Reaching a little island of present contentment, a banqueter on a safe raft mimicked Odysseus's most arduous, solitary voyage. A swimmer acted out the hero's penultimate pain when he had to swim naked to the shores of Phaeacia. But then Odysseus was refreshed at King Alcinous's fabulously gardened palace, Homeric paradigm for all villas, to be dispatched to his own home. Comforting paradox informed these images for these elite Italian viewers, who so often endured by water journey distance from home and family. At Sperlonga, they *were* home.

Why Tivoli: Hadrian, Augustus, and Hercules

All imperial property remained permanently in imperial hands, so when Hadrian succeeded to office, he owned and enjoyed every preceding imperial villa, including Sperlonga. That optional peregrination between shore and shelter illuminates the layout of Hadrian's estate (Fig. 7). At Tivoli, Hadrian chose to acquire a slightly elevated table in the valley flats and its late Republican villa rather than a popular ravine and cascade site.[130] His project to rework it spanned his reign and was noted in his biography.[131] He remade this landscape to give it more emphatic vertical relief and sometimes to level natural undulation. For the water garden he did both.

William MacDonald and John Pinto have shown how this declivity[132] is the principal

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tives," 64. For ship images as votives for marine labor or catastrophe survived, see *Das Wrack* (as above, note 28), 70–75, notes 13, 14.

[129] Imagine them passing around these stunning gems with Augustus as Neptune. On the Boston intaglio, Neptune–Octavian strikes at his drowning enemy (*Kaiser Augustus*, 467, cat. no. 247; Zanker, *Power of Images*, fig. 82). In the Vienna cameo, Octavian celebrates triumph in a real costume on a *quadriga* drawn by tritons, who brandish political emblems (see my *Dynasty and Empire*, fig. 19; *Kaiser Augustus*, 466–67, cat. no. 246; Zanker, *Power of Images*, fig. 81). These are the only two extant. Since both are from Hadrumetum in North Africa, they must have been shipped. Were they naval badges or amulets? Cf. note 30 and Tonio Hölscher, "Actium und Salamis," *Römische Mitteilungen* 99 (1984): 187–214.

[130] MacDonald and Pinto, *Hadrian's Villa*, 137; Mielsch, *Die römische Villa*, 142–50. Republican nucleus, MacDonald and Pinto, 33–37, figs. 21, 22, late 2d and early 1st century B.C., renovated ca. 50 B.C. with Augustan touches, the new palace adapted its orientation, footprint, and concepts. This villa already had interesting *nymphaea*, its plan "generated from the *nymphaeum*-to-*nymphaeum* core axis." On the physical site and its reshaping, see 24–37; on sculptures, 7, 141–45.

[131] *SHA* 26.5; see note 174. 23.8, his hemorrhage here; 25.5–8, once Cicero's, his villa at Puteoli where he died, was buried, and a funerary temple was built for him (27.2–3); 15.5, walking in his *viridarium* (garden) at Tarragona; 26.2, his fondness for riding and *ambulatio*, which included exercise at villa gardens. See also notes 145, 150.

[132] The dignified, more public reference was established by the two images of worshipers, a priest and a sacrificing figure, and the portraits of the Severan Empress Julia Domna, an unidentified man and a child, and Hadrian. MacDonald and Pinto, *Hadrian's Villa*, replaced Renaissance toponyms with labels architecturally

reception precinct in the normative itinerary from the palace's vestibule, where "the artistic spirit of the [v]illa is best contemplated." Thus the typical *domus* visitors' ritual of entrance, bath, and banquet took Hadrian and his subjects from a monumental entrance building past large baths to banquet at an artificial channel watered from a stylized cavern (Figs. 8–10). An immensely elongated pool stretched between the pavilion and entrance, whose arcaded lattice framed the pool's curved front. Casts of warriors and Amazons in those intercolumniations let visitors savor their silhouettes and reflections. Walkways, roofed at left and open at right, led to the great triple pavilion fronted by its own still ponds. (The option of a sunny or shaded *ambulatio* was traditional.) The pavilion (Figs. 11,12) was both a destination and a belvedere from which to gaze down the pool along one's traverse. In its center, a great apsidal space screened by columns made a water cave where diners lay on a stone couch, which took cushions at need.[133] Here, cooled by water runnels falling from the wall behind, along, and before the couch's flanks, guests drank while contemplating the vistas of their prior and eventual traverse. It was these runnels that fed the central square reflecting pool and visually introduced the spreading water vista.[134] The vault, now broken, which was lit from an *oculus* porthole above, curved further outward and downward. This and the greater opening over the inner "cave" and its "interiors" appeared suffused by a marvelous light. Polished marble wall surfaces, now lost, further enhanced illumination. Scalloped like the sharp-edged concavities of a great seashell, the vault had a vivid mosaic of gold and other colors set on a blue ground, which in turn reflected quivering light bounced off water surfaces from the air.[135] This is an inhabitable enlargement of a standard Roman wall fountain, with its cascades under blue glass mosaic. In a lovely play with collapsed fields of vision from the entrance, this *nymphaeum* granted the vista across a domestic peristyle to a foun-

descriptive and functionally suggestive. The Canopus became the scenic *triclinium* (banquet hall) and scenic canal (121.40 x 18.65 m). Here I use the term Canopus and call the villa Tivoli. See 44–45 and 53–54 on colonnades; 139–48 and 119 on sculpture and views; 189 on water sculpture; 157–59 on niche displays and mosaic vaults; 171–78 on the hydraulic regime; 178–82 on plantings and vistas; 189 on outdoor banqueting and strolling. For plantings on side terraces, see Jashemski and Salza Prina Ricotti, "Gardens of Hadrian's Villa," 579–97 (sculptures) and 580 (river character). At the time of this writing, the villa sculptures were newly conserved and in the process of republication; see Benedetta Adembri, *Hadrian's Villa*, trans. Eric De Sena (Milan: Electa, 2000).

133 Salza Prina Ricotti integrated three Tivoli loci into her seminal essay on water *triclinia* ("The Importance of Water"), 175–81, on the Canopus, esp. 175–78; see fig. 13 (plan), 16 (section), 18 (front column screen semi-reconstruction), 14–15, 17, 19, and 20 (views), and the stadium garden (179), and the Piazza d'Oro (180–81).

134 The storage (cf. MacDonald and Pinto, *Hadrian's Villa*, 63–67, 183–86) and slave barracks *cryptoporticus* behind the right walkway was useful to this principal banquet hall. Large assemblies could use couches along the sides. For the two subordinate dining pavilions and a secondary central couch around a little semicircular pool (cf. Sperlonga's island basin, both likely used for chilling containers of drink and food), see Salza Prina Ricotti, "The Importance of Water," 176–77. Side columns also screened the smaller pavilions on the pool's transverse axis.

135 Such round openings like Tivoli's had long figured in bath apses. Nero's domed dining room and extant polygon hall each had one. Set in a spherical concavity, it evokes Hadrian's Pantheon and would have also "surprised" anyone coming under its shell.

tain apse. Both its living *and* stone "inhabitants" resembled such a fountain's pictured water gods.

Above and behind the apse, through an elevated tall central arch in further recesses, the elites inhabited a suspended island platform guarded by long-lost images. Underfoot, the "river" gushed to feed the pools below from a fictive cave farthest back, a lofty apsidal niche encrusted with "stalagmites."[136] This suspends experience of an apsidal water hall. It was possible to look up to this seemingly inaccessible retreat and hear its sounding waters in the *cavea* below. To enter, visitors passed back into the pavilion to mount a hidden stair, winding in darkness, to emerge over the waterfall and gaze down the pool vista, a theatrical, melodramatic pleasure; it was as if visitors entered *behind* the waterfall by Tivoli's citadel to join a river god at his source cavern, for the water *did* flow down the great pool toward hidden drains. It was as if this were the Mediterranean fed by the streams of the world's rivers, Nile and Tiber statues (Figs. 13, 14) "sprawled" at Anio's waters. They cued guests to grasp the riverine aspects of a generic pool contour and to remark on the marvel of the pool's current as they walked "upstream," after having crossed real streams to reach the villa.

This scenery turned strolling, swimming, or punting into a cruise along the shores of the Mediterranean: The entrance lattice had armed warriors at the water's brink, as if to slake their thirst after war's exertions. Their placement implied boating *in* the pool, since viewing them up close frontally, which was optimal, required an approach by water. Some were wounded Amazons, replicas of fifth-century B.C. masterpieces at Ephesos's Artemision, whose goddess the Amazons served. The vestibule contained at least three other similarly dressed figures, a Diana or two and an Atalanta.[137] The lattice set also aesthetically signaled contest, for they were considered competing works of fifth-century masters. The helmeted and armed nudes, eclectic syntheses from other famous works, were likely the Greek heroes led by Hercules or Theseus who drove the Amazons across the Hellespont into the Troad and to Ephesos.[138] At sunset or sunrise, roseate reflections on the surface of the water became the "blood" of the wounded Amazons, delicately touched in color on the marble. Since the fifth-century Greek wars against Persia (Parthia), Amazons had symbolized any western campaign against Persia. Hadrian did not invent this conceit. At the enormous swimming and boating pool of the Julio-Claudian court villa at Oplontis,[139] winged Victo-

[136] On the play of spotlight and vista, cf. Mielsch, *Die römische Villa*, 77, on the Piazza d'Oro. Niches: the long water vault, four on the sides (the entrance preempts one); a commanding figure in the back "cave"; the front apsidal hall, three to four statue niches, four additional, marble-veneered shallow step-cascades.

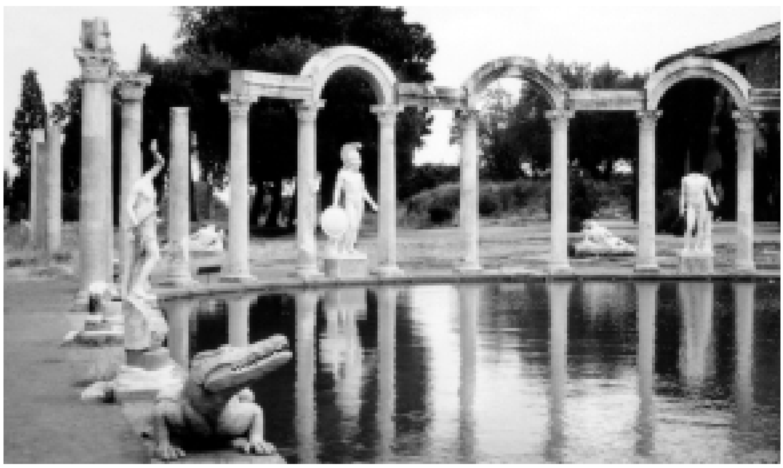
[137] MacDonald and Pinto, *Hadrian's Villa*, 148.

[138] These are not likely Mars and Hermes, *contra* some (MacDonald and Pinto, *Hadrian's Villa*, 148). Pliny (*HN* 34.53) names works of at least five artists for the Artemision (anti-Persian victory group?) said to have voted on one another's quality. Three were often copied in marble from the bronze originals, attributed now to Pheidias, Polykleitos, and Kresilas. John Boardman, *Greek Sculpture: The Classical Period* (New York: Thames and Hudson, 1985), 213–14, figs. 190–95; Andrew Stewart, *Greek Sculpture: An Exploration* (New Haven, Conn.: Yale University Press, 1990), figs. 388–96.

[139] Important entertainment rooms centered on this *natatio*, and it was lined by images looking onto the water, as Stephano de Caro notes, approached by moving in the pool; see "The Sculptures of the Villa at Oplontis: A Preliminary Report," in *Ancient Roman Villa Gardens* (as above, note 6), 79–133, cat. no. 22r. Like

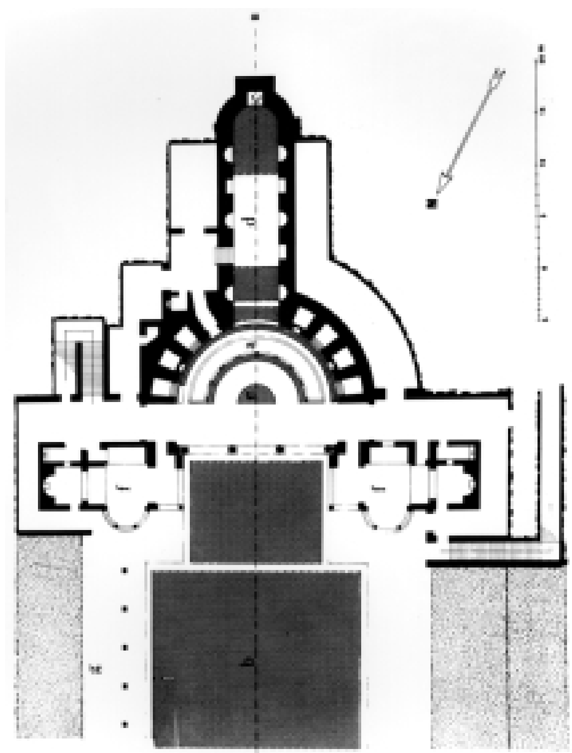
8. Tivoli: Front arcade lattice from without, as seen after leaving the villa vestibule zone and turning right. The view through to the dining pavilion is slightly off axis.

9. Tivoli: Arcade lattice from within. Some sculptures, like the dying Amazon and two warriors, are casts of their originals reinstalled in the same locations. (left, foreground) The originally green crocodile and (background) the Nile and Tiber frame the entrance.



10. Tivoli: The pool, from the end of the once-covered ambulatio. *Note the caryatid loggia supports, entrance lattice, and (right) the slope of the banked garden perimeter.*

11. Tivoli: View down the axis of the pool from the elevated platform within the dining pavilion. Note the curve of the lower stone couches (with modern figures for scale), the square pool before the pavilion shell, and the banked garden perimeter. The central intercolumniation of the pavilion screen colonnade once had an arched entablature like the arcade in the distance.

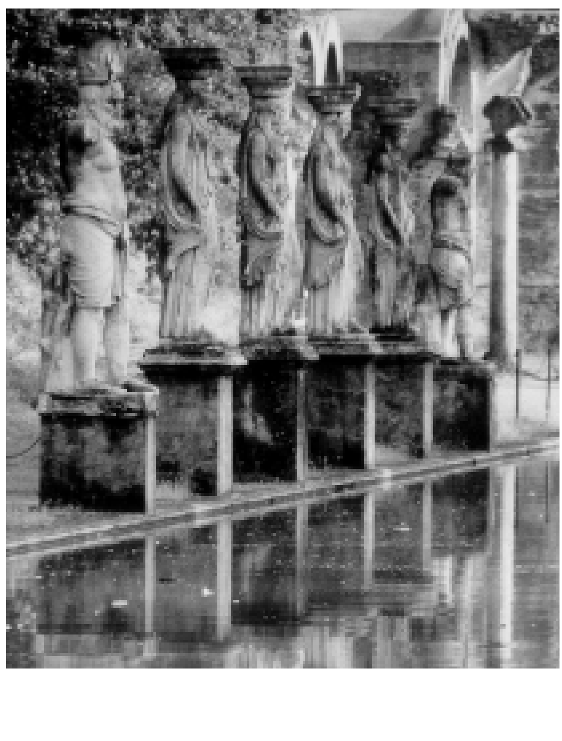


12. Tivoli: Plan of the Canopus *dining pavilion (from Salza Prina Ricotti, "The Importance of Water")*

13. Tivoli: A modern cast of the Nile (with striped bar in foreground to denote scale)

14. (left) Tivoli: A modern cast of the Tiber, with fragments of the miniature group of the "wolf and twins" visible under the right arm

15. (below) Tivoli: Four replicas of the Erechtheion porch maidens stand surrounded by two satyrs resembling the Egyptian god Bes.



ries and Hercules herms framed a Romanized prince and his Amazon opponent. Thus at the outset, the compound heroically complimented the Parthian conqueror Hadrian and his accession in Mesopotamia on Trajan's Parthian campaign, which Hadrian won by treaty, like Augustus in 19 B.C.[140] Hellenistic and Roman rulers evoked eastern conquest with the image of the Asiatic Dionysos. Therefore, other generic images, like Dionysos, a satyr, and two Indian panthers, could denote territory, journey, and empire.

Visible afar, the mythic armies marked the hither margin as an Aegean port: Athens or Ephesos. Further down the pool on the right, visitors sailed or walked past a strange caryatid group that united Greece with Rome and Egypt (Fig. 15). At either end, bandy-legged, potbellied old basket-bearers burdened with produce resemble comic satyrs and the benevolent Egyptian god Bes.[141] Between them, four taller, elegant maidens replicate Athens's Erechtheion porch, but their direct, local source is the earlier replica set at Rome, the galleries of Augustus's Forum to Mars Ultor, god of Parthian conquest.[142] At poolside, the vessels in their hands complement their setting, as if the girls *had* come to draw water.[143] Hence, the group juxtaposes styles of classicism and grotesque realism; Dionysiac "nymphs" with "Silenoi": lovely young slaves, who attended the pavilion symposiasts juxtaposed with fat old ones, stock figures of Roman comedy, lugging in loads of fruit. Other fragments and sculpture from the Canopus and its pavilions also made discrete groupings;

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columns, trees lined the pool's long display side, statue bases before their trunks. De Caro (129) observes that the ends make an ABC/CBA mirror set: at each end a Hercules herm, then an alighting Victoria, frame a young nude warrior at the nearest corner and at the other end an Amazon. At the Villa dei Papiri earlier, De Caro notes the herms in the smaller peristyle garden, pairing an Amazon with a 5th-century male type, Polykleitos's *Doryphoros* (spear bearer). The Victories, unusual as garden sculpture, signal politicized decoration for the owner Poppaea and her young husband Nero. The nude prince (cat. no. 15 [*ephebe*]) wears the Roman commander's cloak (*paludamentum*). Once reddish purple, it made a striking backdrop, and the lowered right hand of the prince curled around a spear. A heavy metal object in the raised left hand shows holes for pins, likely a sheathed sword. The prince wore an attached diadem (not the athlete's *taenia*), the fillet of Hellenistic kings. The young Hercules (De Caro, cat. nos. 13–14) may deliberately harmonize with the young prince.

[140] Tigris and Euphrates frame Mesopotamia, who kneels to Trajan on his arch at Beneventum (see note 164). In the background, soldiers cross Trajan's wooden bridge, just as his column's narrative opens with the Danube acclaiming Roman armies passing over him on Apollodorus's pontoon bridge. Perhaps the Parthian frontier river(s) had statues at this pool to match the Nile and Tiber.

[141] This is my observation. The dwarf physiognomy characterized by long torso and short legs is unmistakable, and the attempt to emphasize short stature next to the taller maidens is clear. Like satyr's clothing, the unusual wrap skirts suggest Egyptian linen kilts. Bes's grimacing images still protected children in Egyptian homes and were repeated for Roman egyptianizing decorations like the archaizing gray Egyptian granite colossus from Amathous (Cyprus) harbor, which is a startling 4.2 m x 2 m (*PECS*, s.v. Amathous).

[142] The male–female pairing humorously answers the entrance's elegant mythic pairing of a draped woman and a nude man; likely, it was replayed in the pavilion. It is unclear whether this series held up only a lintel or loggia roofing. Replicas of the Roman/Athenian figures turn up elsewhere in villas of this century and region; Hadrian's set stressed topographic features.

[143] Apt, since the scarp concealed clustered slave barracks and/or storerooms. Classicizing slave statues had long been popular for lamps and fountains. From the 1st century B.C. (Villa Farnesina stuccoes), idyllic landscapes showed refined young women and short, fat, old Silenus. Cf. Tiberius's costumed servants.

the horse and wing fragments, for example, indicate mythological groups, perhaps Pegasus and Bellerophon at the spring of Helikon or Corinthian Peirene.[144]

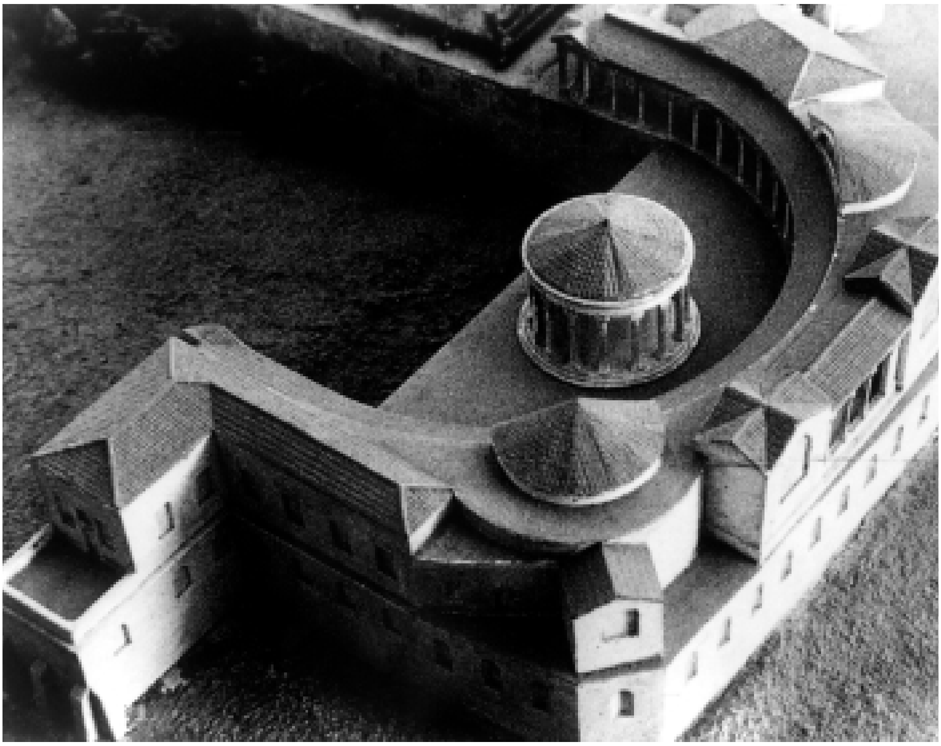
From the walkways and from within, the pool edges thus became the margins of a periplus around Hadrian's empire: Asia, Egypt, and Europe. No wonder that somewhere a statue group personified the provinces, translating serious political monuments in the capital. Up this sea fed by Nile and Tiber was the pavilion, as if upriver to Rome or Alexandria.[145] The postulate that *land* motion suggests *water* motion is supported by another pavilion, an elevated round shrine within a *D*-shaped portico, which supplies a fine archaizing or late imperial replica of Praxiteles' *Venus of Knidos* (Figs. 16, 17). This Venus stands naked to bathe by her water urn; the *tholos* too must have been a Venus shrine.[146] Anyone coming through its portico along its foundation terrace would have been surprised to see how the valley prospect frames the temple. But visitors also arrived from below, up the now-inaccessible shallow valley, to confront an elaborated fountain wall spilling water back down the valley, the temple crowning it as if on a crag. This salutes local prospects, the still-admired round temple (of Hercules or the Tiburtine Sibyl?) on urban Tivoli's *arx* (citadel) overlooking its watered gorge.[147] The land voyage also mimics a sea voyage. Moving spectators enacted the much-celebrated approach by sea to Knidos, whose Doric temple was high on a cliff in its own garden. It housed Praxiteles' masterpiece, which attracted many visitors. This temple was sited like a *pharos* as a cynosure to mariners along the Karian coast for the Venus of Good Voyage (*Euploia*). A fitting patroness to the itinerant Hadrian, she also had promontory shrines guarding the dangerous traverse around Cape Malea at Kythera and

[144] Other groups: e.g., animals, Egyptian figures, portraits (note 132), and Roman ritual groups.

[145] "[He] fashioned the [v]illa . . . in such a way that he might inscribe there the names of provinces"; MacDonald and Pinto, *Hadrian's Villa*, 151, rightly understand statue bases. See my *Dynasty and Empire*, 79–84: "titles of the peoples" at Augustus's Forum (whose caryatids are copied here), which also matched Africa to Europe in its Jupiter shields; the Portico of Pompey; Augustus's Portico of the Nations; the peoples of the empire in the temple of the deified Hadrian. MacDonald and Pinto (151) note the head of a North African found in the 18th century in the Bog.

[146] The Doric order, unusually well represented at Tivoli, combines ancient Greek and Italic architectural traditions. MacDonald and Pinto, *Hadrian's Villa*, 51, 59–60, figs. 49, 50, note the apostrophe simultaneously to Knidos and Caesar's *hortus* shrine. Emphasis on the view back up to this shrine is mine. MacDonald and Pinto, *Hadrian's Villa*, make this valley the *SHA*'s "Tempe," but any wooded garden could do if it led through a steep, constricted wooded ravine to a cave, as they cite Ovid's description, and the open view to the shrine is different from this wild vista.

[147] For the still spectacular Temple of the Sibyl, see Filippo Coarelli, *I santuari del Lazio in età repubblicana* (Rome: Nuova Italia Scientifica, 1987), 105–6. Cf. MacDonald and Pinto, *Hadrian's Villa*, 148, on the Venus group of the water court (Venus, Hypnos, nymphs, and marine frieze). The Venus crouching to wash from the Heliocaminus bath pool replicates an installation from Anzio's palace. This vista, Venus-*tholos* with porticoes, typifies 2d-style fresco in the 1st century B.C. It also salutes Rome's historic Venus shrines: Venus Victrix centering a curved portico atop the watered cavea of Pompey's theater, overlooking the portico gardens; Venus Genetrix, dominating the Forum Julium, its podium façade also a *nymphaeum* wall; at an imperial villa, the round shrine in Caesar's gardens, next to the great gardened sanctuary of Venus Erycina by the Porta Capena. Ps.-Lucian's description, *Amores* 13–14, and the Aphrodite Euploia, Stewart, *Greek Sculpture*, s.v., figs. 503–7, T 95–100, 128. Lucian, T 98: "When we had taken sufficient delight in the garden plants, we entered the temple." See Pausanias, 1.1.3.



16. *Tivoli:* D-*shaped pavilion and circular shrine, model, bird's-eye view looking southeast down the valley garden (from MacDonald and Pinto,* Hadrian's Villa*)*

17. *Tivoli: View through the shrine ruins, with a cast of the Roman replica of Praxiteles'* Aphrodite of Knidos *visible*

Naples. Thus at least twice, Hadrian made multiple allusive water gardens about traveling past the shores of specific Mediterranean lands.[148]

The rivers crossed to explore the villa estate were framing streams that afforded pleasing dialogue, conceptual and experiential, with overtly artificial waterscapes within the villa core; from these the residents moved back out into the countryside to walk and hunt.[149] From the Republic onward, villa owners named a *locus* to suggest a place meaningful to their interests and to recall their travels. Hadrian named many places in his complex for somewhere else, both real and mythical: for example, the Vale of Tempe, Hades' *inferna*, the philosophic gardens of Athens, and a set of province labels.[150] To walk from place to place was, as within the Canopus, to repeat the periplus around the Mediterranean coasts used to reach them. Even this partial set documents that the whole estate liked to remind visitors of travel through a varied world of the natural and the civilized. Modern eyes too often see such variety as lack of order. The Canopus's multiple riverine fictions accord strikingly with the toponyms' character because each site was remarkable for a specific river and could be suggested by mere mention of that stream.[151] At Tivoli, moving waters and water pathways nourished meaning as much as vegetation. Hadrian inscribed on cities and villas through his architecture the universalizing place analogies of poetry.

This *locus amoenus* alludes to imperial *negotium*. Iconographies of vision and motion make water mastery the presiding metaphor for the governance of spectacle, armies, and continents. Tivoli gracefully denotes current and mythic voyages, with visual parentheses different from Sperlonga's gripping narrative emphases. But it adds in the variety of suggested motions to what it eschews of Sperlonga's immediacy, narrative unity, and "real"

[148] For Naples and Cape Zephyrion overlooking the Canopus, see Bergmann, "Painted Perspectives," 62. For Cape Malea, see *Das Wrack* (as above, note 28), 158. Cf. popular taste for seaside city portraits, launched in the 2d century A.D., on luxury glass from harbor towns: Donald Harden et al., *Glass of the Caesars* (Milan: Olivetti, 1987), 208–9, cat. no.116. In *From Pergamon* (as above, note 40), De Grummond, "Gauls and Giants," 271–73 note 92, attends to topographic references but not travel.

[149] Villa contours were Janus-faced. An important view was from outside at points opening to the occupants' return, but the field of Landscape Studies tends to ignore unaltered topographies. To us, a "find" is a constructed and planted garden. For villas' "natural" river and island visits, cf. Cicero, *De legibus*, Bk. 2.

[150] *SHA* 26: "He constructed his villa marvelously, in that in it he could inscribe the famous names of places and provinces; for example, he would say Lycaeum, Academia, Prytaneum, Canopus, Poicile, Tempe. And that he might omit nothing, he even shaped an 'Inferi' (Underworld)." The chapter discusses his villa practices (i.e., hunting). His favorite prey, a lion, signals a gamepark. Athens's Prytany is a council chamber, its Stoa Poikile, a public place with commemorative war history paintings. Chaps. 16 and 26 describe the literature and drama he favored as entertaining recitals including distinctively Italic forms and authors. Hadrian may have favored Greek banquet dress, but in it he observed Atellan farce. This literature spans the comic, tragic, epic, historical, and philosophic. Chap. 16 stresses his taste for the oldest Latin masters and chap. 19 his public revivals of ancient Latin theater.

[151] Cf. Bergmann, "Painted Perspectives," 56, 69 note 2, on Statius attributing such reach to Pollio's villa; 50–51 on the strategies of manipulating allusive *topia* of poetry, painting, and villas. For a list of toponymic pavilions, see my "Looking outside Inside," 8, 31 note 10. The Vale of Tempe (note 150) may be one of the unimproved stream courses. The Lyceum and the Academy rose on the banks of the Ilissos where Socrates still invites readers of Plato to sit under the shade of a plane tree. The rivers of the *inferi*, Styx and Acheron, were metonymically deployed constantly.

seashore. Here artificial contours laminate different geographies and kinds of motion, one over the other. Just as motion on the hard paths suggested a water cruise, so motion in the water suggested exciting motion on land. The pool's contours and its tiered and banked garden frame the stylized circus stadium, especially the Circus Maximus. Its scale approaches that of the sunken stadium garden at Hadrian's main urban residence, the Flavian palace enclosed over the real Circus Maximus.[152]

Urbanity in general and the *urbs* in particular thus also informed the largest contour of this quintessentially leisured rural retreat. Although the stadium-shaped garden (*hippodromus*) decorated grand villas from the time of the Republic, this one is twice special. It reproduces not only the circus's footprint but also its banked interior in elevation. Whereas turf floored other stadium gardens, this circus was floored with running water. That made permanent one of the most impressive imperial spectacles: the flooding of Rome's circuses and stadia for mock sea battles and mythological water tableaux. The novel sculptured sea battle at Sperlonga suggested the then-new reenactment of historical naval battles in the flooded circuses. Here suggested identity was emphasized by the way that the pool contained a burlesque of the circus's central *spina*, for two plinths studded the ellipse where a *spina*'s finial monuments sat. As with the orientation of the framing sculptures toward the water, the overt mirroring of the circus shows that people *were supposed to* move along these waters, swimming or in skiffs, for pleasure *and* as a spectacle of motion in water.

At Rome the imperial box gave the emperor a fine view of the tangle of chariots rounding the turning post, where the advantage in a race was either won or lost and drivers risked all in the exciting chance of collision. Safe and lovely patterns were made from the spectacles of danger: Hadrian's pool, denoted as a lap pool by its markers, let him play safely at the dangers of the games while swimming, boating, or watching others play. With Hadrian presiding, viewers assembled at the terminal pavilion or by the caryatid loggia, doubtless making joking bets on friends or slaves like gamblers at circus chariot races. Such games took place on large enough estate waters, and the pool stresses its "circusness."[153] At the

[152] On the imperial box's iconicity, see Gianna Dareggi, "Genesi e sviluppo della tipologia del loggiato imperiale nelle raffigurazioni degli edifici circensi," *Mélanges d'archéologie et d'histoire de l'Ecole Française de Rome* 103 (1991): 71–89. Hadrian's other stadium garden (MacDonald and Pinto, *Hadrian's Villa*, 76–77; Mielsch, *Die römische Villa*, 75–76) also transformed a normal circus space. Red sand perimeter paths meant it hosted runners, but the core was a pavilion lined with statues and freshened by water runnels open only at its ends. A *cavea* fountain with water stairs like circus seats and plantings governed the far end (Mielsch, ibid., fig. 53). Cf. two gladiators recovered by the east-west terrace (MacDonald and Pinto, *Hadrian's Villa*, 146).

[153] For Marcus Aurelius's pleasure in watching rowers stroking time, see Fronto, *Epistola de feriale Alsino* 3, on his charge's visit to his villa at Alsium. His other pleasures were reading the Latin classics, wandering the seashore, and taking boat excursions before going to the baths and having a seafood dinner. The Circus *spina* was decorated with sea beasts and dolphins carrying balls shifted to mark the laps. Sidonius, *Epistles* 2.2: a lake of about two miles with a central island "and, for aquatic sports, a turning post on a pile of boulders, scene of many a gay collision" (Littlewood, "Ancient Literary Evidence," 28). On water mime in public circuses, see Kathleen Coleman, "Launching into History" (as above, note 125); Gustavo Traversari, *Gli spettacoli in acqua nel teatro tardo-antico* (Rome: "L'Erma" di Bretschneider, 1960). Cf. in sarcophagi and late Roman mosaic (*LIMC*, s.v. Eros/Amor marine scenes) floors and basin linings that depict *piscina* sports and marine circus burlesques like swimming, wrestling from dolphin backs, and racing dolphin mounts and then crashing or falling.

spina ends where a fast wooden chariot might be smashed, deathly water monsters, Sperlonga's Scylla innocuous in stone, seemed to attack wooden ships that came too near. To round either Scylla repeated the route Hadrian had taken to reach Latium, attaining south Italy from the eastern empire or from North Africa.

A water "monster," a crocodile in lifelike greenish stone, vomits water at one of the pool margins. This horrid denizen of the marshes *populates* the pool like a Nile, as the river's personification does not. It brings to reality those Nilotic fantasies that began to cover Roman floors and walls in the second century B.C. As if in a menagerie, this man-eating water being is comical, but in the context of Hadrian it makes an allusion to pain. Since Augustus's day, Egypt belonged especially to the emperor, and Hadrian cruised the Nile for pleasure as well as for business. On such a voyage, his lover Antinous drowned in circumstances—suicide, murder, accident?—that still fascinate novelists and historians. The loggia caryatids here likely allude to the boy.[154] Nearly incapacitated by grief, Hadrian stocked Tivoli and the empire with images of Antinous divinized in Egyptian and Greco-Roman forms. If the Canopus is Hadrian's private pleasurable Nile, it is also the river of his own pain, a nightmarish swim, whether it was designed after his return from Egypt or started beforehand but left unaltered.

Home from his perennial voyages, Hadrian arrived at the Canopus among the first of the pavilions of his *secessus* to Tivoli, where he reenacted his voyaging in miniature: by choosing speedier or slower motion at will, walking his pool's circuit or floating its length, and swimming or being rowed to his collected statuary, which was based on originals he had seen in Greece and Asia. Overt tributes to *his* Rome dignified his *villegiatura*. The gentle garden transformations of imperial grandiosity soothed the strains of more formal, dutiful habitation. So much of Hadrian's journeying was for warfare and seeing to the empire's frontiers. At Tivoli his virtuous and soul-scarring toil turned into stimulating domestic exercise: *ambulatio* and *natatio*. The hairy, contorted bodies of Rome's enemies, which had been left in his campaigns' wake, became beautiful dying Amazons at this sea's frontier; to him, the caryatids became conquered women (Vitruvius, 1.15) in the company of his own dead soldiers. The evocation of the tragic Nile voyage was its own consolation, for some forms under which Hadrian deified Antinous show that he knew the Egyptian landscape of belief, which promised immortality to the soul's voyage.

This garden aestheticizes ugly death and agony: Event became art, the world a museum, solid walls turned to trees and air on which marble lines were almost painted. It was salvationary because it repeats forever Hadrian's remembered lifetime pleasures in a garden paradise that promises perennial happiness. Its traverse signifies that lucky chance—Fortuna, the goddess at Tivoli's entrance—prefers emperors above all others in life's chariot race.[155]

[154] Hadrian founded Antinoopolis (also known as Besantinopolis or the city of Bes-Antinous) near the site where the youth had drowned (*PECS*, s.v.). It was near the city sacred to Bes (Besa), a significant point in Roman minds because Bes guarded children and the afterlife. Other egyptianizing images here are Apis-Isis and Ptah. Isis's connection to salvific waters and water architecture of her Roman precincts are well known.

[155] For sculpted Fortunas between the vestibule and scenic canal, see MacDonald and Pinto, *Hadrian's Villa*, 148.

Since at least the second century B.C., the Roman elite aimed to own many properties as salubrious retreats for different seasons: cooling or humid breezes by the seaside or riverside, at an inland elevation by a waterfall or lake at the height of summer; more sheltered inland properties for the beauties of spring, late summer's vintage, fall harvests, and the hunting season that extended from fall to the cold of early winter; in winter proper political elites headed for their cities on senate and council business. Tivoli was meant for early spring or fall enjoyment, to avoid insects and the heat and bilgy humidity of summer.

Because Hadrian never constructed a seaside palace does not mean that he did not take seashore vacations at appropriate seasons.[156] To seem a legitimate successor to Trajan, himself brought to office in dubious circumstances, Hadrian surely made showcase visits to Trajan's seaside palace at Centumcellae and enjoyed the Domitianic estates at Circei next to Sperlonga, as well as Castel Gandolfo. For pleasure, health, and as part of his well-known program of imitating Augustus, he cruised the villa coast. Julio-Claudian resort complexes such as Baia and Puteoli on the Bay of Naples had survived the eruption of Vesuvius; palaces at Capri and Anzio, like other resorts now unknown, beckoned.

As the *hortus* belt around Rome made nearly a solid ring of imperial gardens, so the south-central Italian shore was dominated by imperial estates; Italy's core symbolically manifested the emperor's benign mastery of land and sea. Imagine Hadrian bearing Trajan's ashes on his return to Rome from the Parthian campaign. Passing the great villas, his entourage must have repeatedly gestured, "*Dominus*, that is yours." As a young noble, Hadrian knew them even before they became *stationes* (halting stops) on his voyages from foreign campaigns. This itinerary was evoked by the marine *thiasos* reliefs girdling the moated island pavilion offering the ultimate rest at this villa's heart.[157] The length of Hadrian's absences and their character of arduous military supervision invited the metaphor of Odysseus's ten-year voyage, never mind his ten-year siege of Troy, and the wittily doubled transformation of the Sperlonga Scylla shows that he meant this.[158]

What sort of *persona* did Hadrian garner by choosing Tivoli? This palace modeled the binary of *otium* and *negotium*, sanctioning his pleasures by public exertions in war and peace.[159] For this Iberian parvenu, an artificial Republican and imperial lineage was established much as his equally parvenu predecessor Trajan had staked out a Republican-style

[156] For villa locales, see Mielsch, *Die römische Villa*, 126–32.

[157] On the island enclosure, see MacDonald and Pinto, *Hadrian's Villa*, 88–89, 148, 189.

[158] Cf. Horace, *Odes* 2.6. In this elegant *recusatio* he joins himself to his friend Septimius, as Romans bound from state service in Spain, sailing home through the African shoals of the Syrtes (lines 1–4). The rest is a winding mock-positive refusal to join Septimius at his estates at Tarentum (lines 5–9): "Let Tibur, planted by Argive colonist, be for my old age too a solid seat, let it be the terminus for a man wearied by the sea, and roads, and army service."

[159] I doubt Mielsch, *Die römische Villa*, 149, who contends that Antoninus Pius and Marcus Aurelius, the next emperors, sought to eliminate the contrast between the demands of their careers and the villa's traditional repose. If there were texts only for Tivoli, I would agree. Comments on modesty in a villa life devoted to hunting and fishing ignore the traditional *urbanitas* of Roman villas and the great parks thus implied. A formal character is implied by the many surviving imperial portraits, which rival the Palatine (MacDonald and Pinto, *Hadrian's Villa*, 198–99); see also note 132.

clan identity with his Basilica Ulpia. The ancient Latin city of Tibur was thick with historic villas dating to the glory days of the Republic, which preserved the toponyms of their founding patrons. It was likely meaningful that Hadrian encapsulated a fine Republican villa. The city held the villa of Scipio Africanus, who had conquered Carthage. This was likely *his* property, which held the court Augustus had adjoining the ancient elevation of Hercules. It was used to receive embassies from around the empire.[160] However seldom Hadrian was home, image counted, and the internationalizing character of his villa's iconography fits. I agree with MacDonald who remarks that if Nero's palace was *rus in urbe* (country in the city), Hadrian's villa was an *urbs in rure* (a city in the country).[161] Its extensively watered landscape was essential to this character, with the baths, fountains, ornamental pools, and aqueducts characteristic of Rome.[162] Tivoli inverts visions of Rome's primordial marshy character. At the *tufa*-encrusted grotto of the Canopus—the type of pavilion that Pliny the Elder noted was called a *musaeum* (home of the muses)—the emperor imitated King Numa, who gave Rome its first civic and religious laws. As Roman poets and historians liked to depict, the nymph Egeria dictated these laws to him as they lolled in amorous consort in a mythical watered cave in the Aventine woods.

Like Hadrian at Tivoli, every emperor after Augustus who made a substantial new villa seems to have installed as a badge of identity a water garden obtrusively quoting the Odyssean cycle of Sperlonga. That implies programmatic visits by every emperor to what was a marvel of *natura* and *ars*, as much as the great caves that Domitian had enlarged at Albano.[163] In every city of the empire, a ruler saw repeated the generic core of Capitolium and ruler shrine that overlaid familiar "Romanness" onto the world's diversity. He also repeatedly encountered complexes that transmuted now-historical imperial sites at Rome. Only random fortune preserves Sperlonga and the Tivoli palace, but my logic goes beyond simply looking

[160] MacDonald and Pinto, *Hadrian's Villa*, 192: Tivoli is an easy ride within the zone permitted senatorial elites when the senate sat at Rome. See Suetonius, *Divus Augustus*, 72, on his favorite villas; Cicero, *Philippica* 5.7.19, on Antony holding court at Scipio's house, still known in the 1st century A.D. to Seneca (*De benificiis* 4.12.4). See also Coarelli, *I santuari del Lazio*, 85–112, esp. 96–100, on Republican Octavii active here, and 102, on identifying Augustus's villa with extensive remains southwest of the temple, still occupied in the 4th century A.D., like Sperlonga.

[161] MacDonald, *The Architecture*, vol. 1 (as above, note 2), 278–83 (s.v. Piazza Armerina and Tivoli), and MacDonald and Pinto, *Hadrian's Villa*, 193–95; on Flavian villas, see Bergmann, "Painted Perspectives," 58–59.

[162] On Hadrian's irrigation systems, see Jashemski and Salza Prina Ricotti, "Gardens of Hadrian's Villa," 591 f. Investigation is lacking for the historiated geography of Rome's aestheticized and iconic (sacral/political) waterworks, signaled by names and status or archaeological finds, in the sometimes utilitarian categories of *lacus, fons*, and *piscina*. The bones for that enterprise are the regionary catalogues, the *LTUR* entries (*lacus*, *fons*, *stagnum*, *hortus*, *nymphaeum*, etc.), and those explorations of water administration that reveal dedicated *fontes*, surely often aestheticized, by city colleges of *magistri* and *ministri*; cf. Christer Brunn, *The Water Supply of Ancient Rome: A Study of Roman Imperial Administration* (Helsinki: Societas Scientiarum Fennica, 1991) and in *Journal of Roman Archaeology* 10 (1997): 392, reviewing *LTUR*, "fontes."

[163] Those caves spelled out the episode of the Cyclops and updated the Scylla group by casting her in silvery dappled stone, glistening like the fierce gray porpoises that her body imitated. See *Ulisse*, 339–41, Tivoli Scylla: ibid., 342–45.

at brilliant water gardens of different epochs. In his Italian villa circuit, the emperor must have felt at home in a whole series of "family houses," stocked with dynastic portraits. (Like a giant atrium, the Canopus accumulated such portraits.) Without that frame, the stylized references to Scylla at Tivoli cannot be fully appreciated with respect to how it gestures in other ways to mythical frames of struggle over the seas and introduces new and complementary allusions to fresh inland bodies of water.

At Tivoli, Scipio, Antony, and then Augustus meant to don the triumphant mantle of Hercules, who was one of Rome's most important cult figures. They all took pains to link themselves publicly with him, and, as successor to Jupiter-Trajan, Hadrian made an exemplar of Jupiter's itinerant son.[164] Hercules had wandered the world hunting and waging war, activities that Hadrian's public arts took pains to showcase. In the Stoic philosophy that Hadrian favored, Hercules was the sterling model of a just leader cleansing humanity of evil and chaos; his image was recovered from the zone above the east valley.[165] That Hercules had sojourned in Rome and established its first altar for the primeval Arcadian settlement there formed the basis for Roman cults. His visit "occurred" when he was on his way back from Spain, Hadrian's homeland, to retrieve the cattle of Geryon from the monster Cacus of the Palatine. From Augustus's occupation of the Palatine, every emperor dwelt next to the Stairs of Cacus. Spoliated ancient sculpture instantiated that history, for the palace was joined to the portico of the Temple of Apollo. The cows of the fifth-century B.C. Athenian sculptor Myron made the herd that Hercules had taken from the monstrous thief to this temple.

Tibur took its name from its builder: Tiburnus. His cliffside source cave, which was renowned for the coolness of its waters and the air of its encircling grove, had modeled the *nymphaeum* of a sumptuous aristocratic villa by the river cascades. The prospects of Tibur's citadel were evoked elsewhere at this villa by the circular Temple of Venus. Like the "river cave" of the Canopus, it was meant to evoke Tiburnus's holy garden. Watered by the diverted streams of the Anio and its nearby feeder streams, the palace thus miniaturized not only Rome but also this nearer city, in both of which Hadrian occupied the palace of Hercules-Augustus. Hadrian's own public art, the famous series of *tondi*, now on the Arch of Constantine,[166] celebrated a grotto cult of Hercules at Tibur in the context of *villegiatura*, like Tivoli.

[164] Trajan took his epithet Optimus Maximus from Rome's major cult of Jupiter. When Hadrian finished the attic story of the Arch of Trajan at Beneventum, whose woodland scenes were to help model his *tondi*, he had himself carved as a young general in a soldier's beard at the shoulder of Trajan, whose toga and gesture were mirrored across the inscription panel by the drapery and gesture of Jupiter Optimus Maximus handing his thunderbolt to Trajan. In the Capitolium's (Domitianic) pediment, Hercules stands before his father, as Titans hammer out thunderbolts for Jupiter.

[165] MacDonald and Pinto, *Hadrian's Villa*, 146.

[166] Mary T. Boatwright, *Hadrian and the City of Rome* (Princeton, N.J.: Princeton University Press, 1987), 190–202, figs. 45–52. These launch Roman commemorative hunt iconography, the most popular subject for sarcophagi at Rome. The presence of Antinous, the nude in the first *tondo*, emphasizes the bucolic villa world. The incomplete set retains start and finish, with a *profectio* from an arched villa portal and the imperial epiphany. The bear (Silvanus) and the boar (Diana) signal Europe and perhaps Anatolia; the lion, Africa and Mesopotamia.

Those circular reliefs delineated an ideal series of hunts conducted from a generic villa in a gamepark studded with rustic altars dominated by masterpiece statues of suitable gods. The first imperial monument to make this favored sport a visual ideogram of warlike *virtus*, the *tondi* culminated with Hadrian's epiphany over a slain lion, Hercules' animal. Next, the emperor made a sacrifice in a cave shrine before a statue of the young Hercules seated on a similar pelt at the end of his own first toil of slaying the Nemean lion.[167] Hadrian has just hung up the lion's skin and a triumphalist laurel garland at the end of his own labors.[168] Hercules sits framed by two votive Roman cuirasses and his right hand is holding out Victory, as if to Hadrian. This homecoming (*adventus*) suggests Tivoli itself, a favorite dedicatory shrine of Republican triumphal generals. The little statue on its rocky ledge depicts Tibur's oracular *Victor*, the only type for Hercules "on arms," whose sanctuary and grove Hadrian must have richly endowed. The unprecedented circular format was exploited to model a concave stony hollow, translating into stone the conventions of pastoral and sacro-idyllic painting, to show for the first time real Romans entering their beloved, sacralized water grottoes.[169]

In the *tondi* Hadrian promulgated at Rome the Tiburtine Hercules, seated over his arms as at banquet after war, to model his own virtuous, manly *otium*. No Hercules is extant from the Canopus, only from the east terrace, but there need not be one. Differently from the Odysseus exemplar at Sperlonga, the emperor's own body sufficed to impersonate the Italian warrior against the Amazons, who stands defeated at the pool entrance.[170]

Apollo needs an animal. See Boatwright, *Hadrian*,197–200, on Hadrian's ostentatious commemoration of hunts in Gaul, Anatolia, Greece, and Libya. It is doubtful that viewers could have read in these generic landscapes the overspecific localizations proposed by many, but they would have known Hadrian's travels and the depicted animals' habitats, as they would also have adduced for gameparks and imperially sponsored hunts.

[167] Alexander the Great traveled with Lysippos's *Heracles Epitrapezios* that sat at his banquet tables on a campaign; at least Romans thought so, and some thought they had the statue, which was passed to Hannibal, then Sulla, and then a Flavian connoisseur. See Martial, *Epigrammata* 9.43. Elizabeth Bartman, *Ancient Sculptural Copies in Miniature* (Leiden: Brill, 1992), 147–52, and on marble and bronze miniatures, 157–86. The small scale of the statue in Hadrian's relief evoked the fetish of Alexander, often, as for hunting, Hadrian's exemplar.

[168] Not in Bartman, *Ancient Sculptural Copies*. The Tibur cult image is copied by the 1st century B.C. in a little Republican marble votive from the sanctuary: a seated beardless god with a trophy cuirass on each side and a helmet by his right foot. This is Hadrianic Hercules' only parallel. For illustrations, see Anna Maria Reggiani ed., *Tivoli: Il Santuario di Ercole Vincitore* (Milan: Electa, 1998), 20–23, noting allusion to the ritual of offering Hercules one-tenth of any spoils. Others (Boatwright, *Hadrian*, 201) want this to be the Hercules of Gades' famed temple (Cadiz) because Hadrian was Spanish. Certainly, Spanish Hercules resonated in any Hadrian–Hercules pairing, but the mature, bearded Gaditanus had achieved his last labor. Art speaks by forms. Viewers in Rome would not have missed visual reference to the local, youthful image of Latium's main Hercules cult.

[169] Cf. the *nymphaeum* wall from the imperial villa at Anzio. A mosaic (at the time of this writing, under restoration at the Palazzo Massimo Museum) in an artificially textured cave apse shows the triumphant Hercules at ease. Hadrian elaborated a real cave cult for Hercules *cubans* (on his couch) on the Tiber's far bank (ex-imperial *hortus* grounds?). The cave and altar were carved from rock, probably with a Hercules statue sprawled drinking inside. It functioned as a victory shrine for circus charioteers for the circus pool; see Maxwell Anderson, *Radiance in Stone: Sculptures in Colored Marble from the Museo Nazionale Romano* (Rome: De Luca Edizioni, 1989), cat. nos. 31–32.

[170] Cf. Felix Pollio's villa in Naples, Statius, *Silvae* 2.2, its waters guarded by Neptune and its fields by

Mastering Water

At Sperlonga, real rock and seawater activated the hyperreal tableaux of depicted story, and those shaped stones in turn narratized barren rock and sea. At the Canopus, geometrically rounded basin frames delineated a little Mediterranean in an artificial way, annotating it with images.[171] Paradoxically, this is where it most diverges iconographically and instantiates also an inland—riverine—waterway in a design that approximates how Sperlonga sought to realize the essence of events linked to sea and shore. It was in response to the naturalistic imperial grottoes available to him that Hadrian designed the Canopus as a stage for *denoted* rather than *delineated* story, its statues arranged in symbolic, geometrically defined patterns rather than interacting in depicted action. Though it seems less sensitive to a *genius loci*, the Canopus states its meanings with even greater emphasis on the shapes of its spatial frames, from its river source cavern to its character of circus garden. One important place the Canopus instantiates is the generic imperial villa, evoking the emperor's *villegiatura* circuit in a way paralleled by the shrines of Hadrian's gamepark *tondi*. The other sort of place it instantiates is the watered city.

At Sperlonga, Augustus's improvements mimic on a miniaturist scale his harbor works at Portus Julius and Misenum; they also gesture toward the great public works at Rome, where Augustus put himself out to strengthen the Tiber embankments. At Tivoli, analogy with Hadrian's public works was inescapable. This colossal enterprise[172] drew upon and so showcased engineering resources available only to a head of state or an army.[173] So too with the art collections: Elite villas were richly decorated, but only someone commandeering state transport could have quickly amassed so many imported sculptures, paintings, fine marble columns, and veneers.

Hercules. He endorses Pollio's construction and receives a villa shrine: Bergmann, "Painted Perspectives," 53, 55. Impersonation games, for Antinous, were favored at Tivoli (e.g., Dionysos, Osiris, and the Roman woodland god Silvanus). Hadrian's imperial grandson Commodus thus glossed a garden pavilion at Rome. This *nymphaeum* in the Horti Lamiani showcased the image of Commodus wearing Hercules' lionskin and carrying his club and apples of immortality. The sculpture includes miniaturized elements of the god's eastern supremacy: an Amazon crescent shield (*pelta*) upheld by kneeling Amazons who flank a heavenly globe, symbol of Hercules, in place of Atlas, upholding the heavens to obtain the golden fruits (E. La Rocca and M. Cima, *Tranquilli dimore*); cf. *Oplontis* (as above, note 139). Thus the popular bedded garden pools' juxtaposed *pelta* shapes may sometimes be iconic (e.g., Domitian's palace at Rome; its dining hall statuary celebrated Hercules).

[171] MacDonald and Pinto, *Hadrian's Villa*, 195–97, comment on Hadrian's patronage in "an age of enthusiastic tabulation," marked roads, and maps. This is an older Roman habit, but the context stands. I disagree that "the western provinces are absent" (196); Italy at least bulks large.

[172] It required moving earth, undercutting cliffs, digging tunnels, and importing a water supply system. See MacDonald and Pinto, *Hadrian's Villa*, 29, on tapping the Anio Novus and undercutting the cliff to add scenic content and height to the villa. On road and tunnel systems, 30 f., see *SHA* 21.5, assisting Latium after the Tiber floods.

[173] See Bergmann, "Greek Masterpieces," on shifts in attitudes. Such massive alteration was practiced by Republican villa makers like Lucullus that it also attracted sardonic critique. By the Flavian period, artifice and mastery of nature, for which nature was to be grateful, were praised.

It can neither be proven *nor disproven* that this pool suggested *Alexandria*'s Canopus, or pleasure canal. However, as Sperlonga emulated major formal watered displays of historical and mythical action at Rome, so Tivoli's Canopus competed with the elaborated water parks of the Campus Martius, which Agrippa had set up for Augustus, just as Hadrian re-created the Pantheon of Agrippa. Only their names survive, but an elongated pool like this was probably approximated by the Agrippan "Eurippus." The Baths and the Stagnum modeled the large square "lakes" of earlier villas and Tivoli also (e.g., Stoa Poecile), fine pavilions doubtless stocked with art of the marine *thiasos* and fountains.

Although Hadrian had made this complex, which was greater in area and splendor than the whole Agrippan project, for himself, *not* the nation,[174] imperial ideology increasingly identified the *person* of the emperor with the *body* of the empire. Trajan had already stated this in a public monument: Trajan's Column, which contains his cremated remains, celebrates his monumental public earthworks and the cutting away of the Quirinal Hill to make the Forum. Decorated with his epic campaign through Dacia, its many images of construction start at eye level, with the bridging of water (Danube), and culminate with his image at its peak. Hadrian's hunt *tondi* made a national exemplar of his villa pleasures. Conversely, his villa showed off *public* care by his *private* exploitation of state resources.

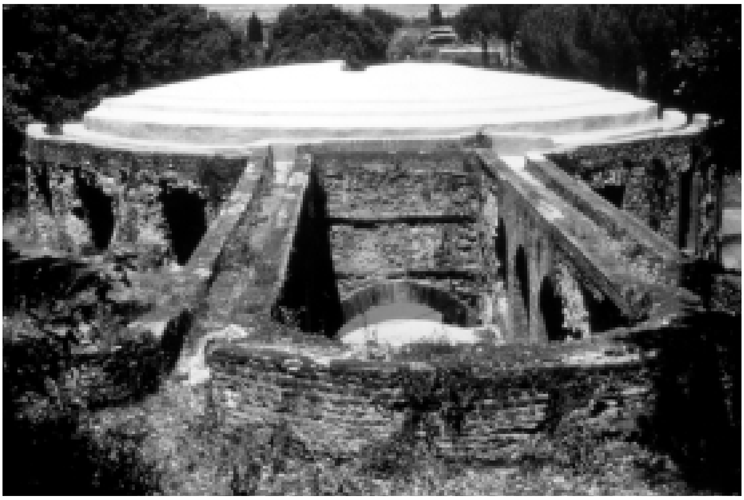
Hadrian likely thought that private displays of water control adduced an emperor's exemplary public tending of aqueducts, river embankments, and harbors. Both at his villa and Rome, he tamed the waters fed by the Anio.[175] Here the aqueduct system enabling fictions of a source cave opens to curious visitors, then as now climbing behind the *nymphaeum* to another terrace zone with its own watered suites behind. This leads to the garden *ambulatio*, which is elevated parallel to the porticoed walkway and leads back to the palace's heart. From behind, the *nymphaeum*'s crown is a mini-Pantheon dome with a web of elevated aqueduct channels feeding toward it: *nymphaeum* as aqueduct terminus (Fig 18). That names a major form of imperial urban display: the elaboration of a *castellum* or *caput*, where the waters of an aqueduct were fed into urban distribution systems. By Hadrian's day, a *caput* fountain was designed to make water not only useful but also beautiful.

Hadrian's fountain hall was understandable as celebrating its own machineries. The inner cascades fed this physical metaphor and evoked the Anio's stunning real cascades at the city nearby.[176] With its columned façade, high window, and views deep into a watered

[174] Hadrian's restorations (*SHA* 19) included Agrippa's baths and the Pontus Hadriani leading to his mausoleum. He sponsored innumerable aqueducts in his own name (20), drained the Fucine Lake, and in Africa was a water god whose visit made it rain for five years (22). Fascinating is chap. 10: He cleared from military camps, in his reforms, the *triclinia*, *porticus*, *cryptae*, and *topia* (villa apparatus, portico, sunken pavilions, and formal dining rooms and gardens). Elite garrison commanders likely had become used to installing these.

[175] The Novus and Vetus aqueducts were named for the Anio. Paradigmatic for mentalities is the treatise *De aquis urbis Romae* offered to Nerva by his noble *curator aquarum*, Frontinus, well-known technical literature for Hadrian's generation. Nerva's authority shows his *diligentia* and *amor* for the nation. Care for aqueducts is "an office that concerns not merely the *usus* (utilities) but also the *salubritas* (healthiness) and even the *securitas* (safety) of the City, and that has always been administered by the *principes* of our *civitas.*"

[176] H. Chanson, "Hydraulics of Roman Aqueducts: Steep Chutes, Cascades, and Dropshafts," *American Journal of Archaeology* 104 (2000): 47–73, comments on conjunctions of dropshaft and stilling pond, which



18. Tivoli: Core of the dining pavilion's nymphaeum*, as seen from the elevated terrace behind it. Visible are the water conduits to the fountain and the opening and roof over the inner platform, which offers a glimpse of the main pool underneath.*

vault to a source apse, the *nymphaeum*'s footprint resembled those extra-urban *nymphaeum* halls for Greece's urban aqueducts, still extant, which Hadrian subvented.[177] This Janus-faced representation of complementary fictions asserts a mutuality of beauty and utility for natural and human construction. It aligns human artifice as a point on a spectrum that includes *natura* in the coming-to-be of this watered world. Exposed fountain mechanics are to be savored along with the bird's-eye view of the "river" pool afforded from the same vantage point. These vistas link motion to three simultaneous perceptions of water: as a *transported* substance, as an element *in* motion, and as it affords *our* motion.

A master of water on a human, contemporary scale, Hadrian configured the Canopus as a mythic *locus* where he became not only *a guest of water gods* but also *an authentic water god*.

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describes the water display. His site table (51) shows four along the Anio Novus and three consisting of rock tunnels, which are identified with the *inferi* (see *SHA*) and called on tunneling skills developed for grand water systems. For the Canopus feeder system, see Salza Prina Ricotti, "The Importance of Water," 176 (as above, note 6): water collected in a settling cistern over the "waterfall," 45 ft. above ground, feeding all water displays through two drop chutes. MacDonald in *PECS*, s.v.: "Copious sources of clear water in the hills NE account for the many aqueduct bridges across the neighboring valleys; four of Rome's aqueducts passed by Tivoli."

[177] Frontinus wrote that the wealthy patron class who donated these *castellum fontes* wanted them called *munera*, also the word for donated spectacles. On Greece, see S. Leigh, "The 'Reservoir' of Hadrian in Athens," *Journal of Roman Archaeology* 10 (1997): 279–90, passim, on the *caput* on Lykabettos Hill in Athens and the hall on the Larissa Hill at Argos. I reject a referee's comment: "[T]he grotto form . . . should be explained as conveying the image of the aqueduct's water source into an urban context" because these were extra-urban (290, note 37). However, like the Canopus, they translate as *river* and *cave source*, the facts of an aqueduct's course, whether below or above ground, and place that "spring" where expected for an aura of instant antiquity in a plausibly extra-urban slope. Cf. Corinth's famous *fons* of Peirene, since the 1st century B.C. romanized with an arcaded front before the spring's water basins toward which visitors, as if diving, leaned through niches with fish frescoes. Water issued from a deeply excavated fissure whose cave identity was emphasized by leaving the rocky arch visible through the arcades. See Betsey Robinson, "On the Genius of Place and Master: Corinth's Roman Fountains" (Ph.D. diss., University of Pennsylvania, 2001).

Tibur's sacred landscape was renowned for the grove of the nymphs of Albunea, who were celebrated by Horace in connection with his own Tiburtine villa. Here the river god Tiburnus resided in the holy grove's water cave.[178] For Roman visitors this was the obvious type for Hadrian's magnificent cascade grotto, as his villa's reception precinct nested in its elevated ring of trees.[179] Here he reclined in cool shade by a still pond filled by the cascade from Anio's mossy grotto, which in the words of Statius's poem for a villa also at Tibur frames it within a narrative of travel as being *more places at once* than Tivoli's extant toponym set. Home at Tibur, Hadrian played at being Tiburnus, settled after his own long voyage from Argos. He could also congratulate himself on playing out Horace's style of country retirement near Tivoli, laid out in a series of poems canonic to any subsequent Roman reader and Tiburtine villa owner.[180] The Canopus's program is also visible through the masterpieces of great artists like Pheidias and patrons like Augustus. It is a Roman stance that the tropes of the visual arts should also call up literary masterpieces. Horace, Vergil, and Ovid constituted that body of texts associated with the Republican and Augustan Golden Age, which painted visions of the Roman bucolic, pastoral, and mythical landscape, its staffage, and important events. Alongside reflections of Augustus's caryatids, two prominent literary visions were intended as models of the "good" prince. The human protagonists, Aristaeus and Theseus, reached water palaces during journeys: one hero traveled around the western Mediterranean and the other around the eastern end, mimicking the Canopus circuit.

According to the fourth *Georgic*, Cyrene, in a grotto in North Africa amidst her court of water nymphs, receives a visit from her son, who was fathered by Apollo: the seer shepherd Aristaeus. On a quest to find a cure for his sick bees, Aristaeus is magically drawn through a gateway pool into the space behind its waters: Cyrene's cave *nymphaeum*. Here nymphs offer libations to Ocean, and the world's rivers, including the Tiber and Po (3.360–85), gather with Tivoli's Anio River. This *Georgic*'s famous proem about the bees' palace is itself a villa prospectus. Vergil intended the bees' polity and Aristaeus's quest as metaphors

[178] Coarelli, *I santuari del Lazio*, 104–5, on the texts, Tiburnus's *lucus*, and the Tiburtine Sibyl. Through the 4th century A.D., this was a *locus amoenus* of poetry and pilgrimage; Vergil, *Aeneid* 7.81 f., cf. Servius ad loc.; Horace, *Odes* 1.7.11 f., Ps.-Acron ad loc., "delectabile nemus;" Tibullus, 2.5.69 f.; Lactantius, *Divinae institutiones* 1.6.12; Statius, *Silvae* 1.3.70 f.

[179] See Statius, *Silvae* 2.3, lines 70–82, on Manlius Vopiscus's riverine villa, waterworks, and gardens. Statius groups with his grotto Egeria's cave on the primordial Palatine, Greek oracular woods sacred to Pan in Sparta and Arcadia, Apollo and the Dryads at Parnassus or Helicon, Hercules' oracle here (Tirynthian *sortes*), and the *Fortunae* of Praeneste's (water cave) oracle, ending with Alcinous's ever-fruited palace orchards at Phaeacia described in the *Odyssey*.

[180] Hadrian became owner of Horace's villa, which was willed to Augustus at Horace's death; it might be Horace's villa at Licenza. Its natural water amphitheater shows the sort of aestheticized natural water source that the Canopus imitated. Here I am interested in the Tivoli poem, *Odes* 1.7, about a visit to Tibur that helped Horace decide to move here. Lines 13–14 address the city's sacro-idyllic vistas, of the Anio cascade, Tiburnus's grove, and fruit orchards wetted by *mobiles rivi*. These are either the cascades' jumping strands or temptingly (K. Quinn's commentary, 136 ad loc.) the net of irrigation channels from the Anio, *mobiles* because the waters can be directed. See *Horace: The Odes*, ed. and comm. K. Quinn (Hong Kong: Macmillan, 1980). That reading makes a nice pairing by Horace like my apposition: water naturally channeled, falling down into a gorge, and water led by man down into artificial channels.

for nation making and just rule. Further water banquets and visits to numinous caves both precede and follow it. Aristaeus's itinerary called for entering Cyrene's hall after visiting a splendid canal garden, Egypt's Canopus (285–95); for his quest's resolution, his mother takes him to the grotto of the sea god Proteus. The closing scene takes place during the imperial era at the Euphrates River, where he acknowledges Caesar Augustus as Parthia's master. Doubtless that panegyric was quoted often in Hadrian's presence, since he was the *new* Augustus who had completed Trajan's Parthian Wars.

Ovid "constructed" water gardens throughout his *Metamorphoses*, and Books 8 and 9 (8.547–612, 725 f.; 9.1 f., 89–98) expand on Vergil's scenario. The just, god-born prince is Neptune's son, Theseus, returning to Athens from Arcadia: from wilderness to capital. Along the way, he makes a villa visit at sea and river. The mighty River Acheloos benevolently shelters the *Neptunius heros* and his companions from Acheloos's own spring-swollen flood, and he feasts with nymphs and the sea-god Proteus. Acheloos's cave with its seashells mimics many Roman fountains and grottoes. As from Roman maritime villa caverns, the guests gaze upon the estuary prospect and ask their bull-horned host about the islands they see.[181] Like Hadrian at Tivoli, the river god can explain that he *made* those islands.

Athens's modern ruler, who remade the city's monumental topography, would have generically invited comparisons to Theseus. Ovid's journeying prince would have attracted him by his Roman pedigree. Local reference in the political allegory of the fourth *Georgic* certainly attracted Hadrian and his visitors to a source cave at Anio waters, joined by a reclining Tiber and Nile. Hadrian and his friends were steeped in these idyllic and triumphalist textual visions. The Canopus was a refuge between world-traversing journeys to the places of these poems, also by a pious prince, son of a god. Hadrian built his *nymphaeum* so he could be hosted *by* water gods and also *be* a water god, conceptually master of the world rivers convoked by sculpture, at the waters that he made to move through the Canopus.

"Shall I Admire First the Genius of the Place or of Its Master?"[182]

Public and private were equally communal in Roman society, their rituals deeply intertwined. Sperlonga's micro-Mediterranean is synchronous and symbiotic with another Augustan project: the Porticus Vipsania erected by Agrippa "to put before us the world, made to be looked at."[183] That map of lands, rivers, and seas codified not only science but also the landscape of Roman conquest and colonization, which was replicated across the empire.[184] Both sites illustrate Nicolet's postulate that "[Roman] geography as science and

[181] This scenario is influenced by art. Cf. the fictive votive relief (Pollitt, *Art in the Hellenistic Age*, fig. 189). Within a cavern from his rocky seat before an altar, Acheloos watches dancing nymphs who have just been led in by the lounging Mercury. Sprawled on a ledge overhead, Pan tootles on his pipes. This late Republican fantasy is based on the Acheloos votives and caves of Greece (see Ridgway, note 76).

[182] Statius, *Silvae* 2.2.44–45.

[183] *Proponere orbem spectandum*: Pliny, *HN* 3.17.

[184] Nicolet, *Space* (as above, note 28), 5. On the needs of Rome's elites, armies, and subjects, see 64, 73. See also 99–111, the map portico (Porticus Vipsania 7–2 B.C.), with its marked distances between major ports and labeled rivers, mined by Pliny the Elder (*HN* 3.16–17; 4.78, 81, 105; 5.102; 6.37), and probably Vitruvius,

representation . . . is fundamentally a political history, [its monuments] stentatious, connected with triumphs . . . and linked . . . to a mythical way of thinking or to collective interests."[185] These villas domesticate that sensation of feeling at home in the Roman world that map pavilions offered to an urban audience. Sperlonga and Tivoli borrow the exemplary character of Roman chorographic monuments, learning more clearly by the eye the greatness of the world stage for the stories of empire and emperor. They instantiate three-dimensionality capable of being journeyed in, the explicating graphic vistas of geography and events that are well known from Roman public commemorative at the worlds constructed by imperial fora and triumphal monuments.

Sperlonga and Tivoli hint at the potentially personalized enjoyment of *any* Roman landscape. They could not have functioned save in a culture in which their designs could be understood because of others' analogous practices. Over time, as they themselves engendered imitations, that too served to mark Roman landscape practice. This is only one kind of Roman garden, but it is perhaps that which most benefits from trying to historiate ancient experience for us.

We are used to water displays that we are *not* supposed to enter, whose sculptures we are meant *not* to touch, and for which we are *not* acculturated to understand our circumambulation as a mimetic journey. The Roman binary of beauty and utility can seem too easily comprehended, for utility is a variable and culturally assigned value. Romans taught themselves to justify *any* garden as therapeutic, civilizing, and, when not imagining a "love nest," conducive to social morality. These special examples at Sperlonga and Tivoli exemplify how *any* Roman water garden offered motion through cycles of immersion and emergence as a means of cleansing both inner and outer exhaustion. In a fluid and incalculable world, their controlled images and topographies restaged in beauty and safety graver challenges in order to sharpen present ease by contrast and promise catharsis for any past or anticipated anguish.

8.2.6, noting the *capita fluminum* (river sources) painted and inscribed in world maps and by the Augustan Strabo. Augustan mapping iconography includes the Forum Augustum and Ara Pacis; cf. my *Dynasty and Empire*, 80–83, 90–92, 104–6. Augustus made these emphases in visually and physically traversed spaces.

[185] From Nicolet, *Space* (as above, note 28), 72. Cf. 111–12, speech given in A.D. 298 (*Pan. Lat.* 5.20–21) in Autun's replica *porticus* before the Tetrarch Constantius Chlorus. Eumenius hints that he gestures at the pictured world (*depictum orbem*). On the *adventus* context, see Sabine MacCormack, *Art and Ceremony in Late Antiquity* (Berkeley: University of California Press, 1981), 27–28, 286, note 56 f.; on the sea *adventus* panegyrics for Constantius and Constantine, 27, 286 notes 54–55.

MINISTERO PER I BENI E LE ATTIVITÀ CULTURALI

BOLLETTINO DI ARCHEOLOGIA ON LINE

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VOLUME SPECIALE

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MEETINGS BETWEEN CULTURES IN THE ANCIENT MEDITERRANEAN

In collaborazione con AIAC Associazione Internazionale di Archeologia Classica

James Schryver

The Late Antique and Early Medieval Gardens of the East

As a scholar who focuses on the gardens of later periods (fourth century AD and beyond), I come to the gardens of Rome with what I suspect are different expectations and interests than those who see the fourth century as the upper limit of their own focus. For me, the shady paths, orchestrated views, and soothing fountains of the Republic and the Empire are not ripe fruits ready to be harvested as examples of the pinnacles of garden design and experience of their time. Nor do they represent the end of an era as the specter of Gibbons would have us believe. Instead, for me they represent both a new beginning and a reminder that the world did not simply stop turning for the gardeners of the ancient Mediterranean as Rome waxed and waned, especially those not among the most elite, but did indeed continue to change and to develop along with society and culture in general. Below, in discussing what those who continued to garden inherited from their more ancient Roman predecessors, I would also like to suggest that such a discussion implies a lack of pronounced end or complete disappearance of the Roman garden itself.

Although the issue of continuity and change may seem one that is without much pizzazz, from the point of view of the Byzantine and early Islamic worlds, it is one that proves quite intriguing[1]. This is especially true in the case of the former where a comparative lack of evidence causes us to look over the walls of Republican and early Imperial villas with yearning into the gardens preserved by Vesuvius[2]. In the case of the latter, the continued debate over the nature of architectural phenomena such as the 'desert castles' increases our envy over more "straight-forward" sites such as Pompeii[3]. As a result, it is extremely useful to be able to identify probable models and sources and to chart their existence and development over time in order to help to fill out the picture. When one does this and looks at the gardens of the third and fourth centuries as a starting point, the results are quite striking, even if, with hindsight, they are not altogether surprising. In addition, the issue of continuity and change is significant because important questions still remain as to whether the transformation that occurred in cities of the eastern Mediterranean in the seventh century had an effect on gardens and what that effect might have been[4].

One of the first areas in which we see continuation from the Roman garden forward in time is also perhaps one of the last we would expect to see change, i.e. among the upper classes of the early Byzantine Empire (fourth-seventh centuries AD). Specifically, there seems to be a consistency in the attitudes of the

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[1] For an in-depth treatment of continuity and change from the point of view of Byzantium, see KAZHDAN, CUTLER 1982, 429–78.

[2] The most recent discussion of the lack of archaeological evidence, but also the potential for archaeological contributions to the study of Byzantine gardens, is LITTLEWOOD 2002b, 215–219.

[3] For a recent discussion of this debate and its origins, see WALMSLEY 2007, 18–21 and 99–107.

[4] For a brief discussion of this as a question that "should be considered," see WOLSCHKE-BULMAHN 2002, 8. See also, KAZHDAN, CUTLER 1982, 429–78 on the transformation itself and its effects on other aspects of life in seventh-century Byzantium.

upper classes towards gardens during this time. From the time of Marcus Terentius Varro onwards, agriculture and horticulture were considered to be gentlemanly pursuits, and as Anthony Littlewood has pointed out, these beliefs or opinions continued to be held by the Byzantine upper classes[5]. In one instance, a letter from the emperor Julian (r.355-363) to a friend contains a somewhat off-hand boast concerning a vineyard he had planted on his grandmother's estate in Bythnia with his own hands: "Moreover there is there, as a humble monument of my husbandry, a small vineyard that produces a fragrant, sweet wine, which does not have to wait for time to improve its flavour"[6]. Nor does it seem that he was the only emperor with a green thumb. The emperor Herakleios (r.610-641) is known to have created parks and vegetable gardens, and the emperor Theophilos (r.829-842) not only continued the trend in the construction of gardens, but tied these in to the creation of his palaces. Later emperors constructed a mix of hunting parks, formal, enclosed gardens associated with and integrated into their palaces, and combinations of the two[7]. What is more, in a move that seems to echo the frescoes of the Pompeian Second style, the above-mentioned Theophilos encouraged the creation of wall mosaics displaying garden scenes[8]. Here too, this does not seem to have been exceptional and it appears that such practices continued among the elite until the seventh century[9].

In part, this enthusiasm for gardens and the connection of the Byzantine emperors and nobility to certain ancient (and especially imperial) garden traditions can be explained through the imagery and symbolism that came to be associated with them. Most of this imagery centered around various interpretations of creation or renewal, with the garden seen alternately as a bride, creation, paradise, the world, or a setting for victory[10]. Other, more direct equations and associations were also made, however. In some, the garden represented the emperor's virtues. In others, his virtues were equated with flowers. In still others, gardens created by an emperor became a means through which to draw parallels to or perhaps even equate his creative powers with those of the Lord[11].

In addition to what has been called the "rhetoric of renewal," it is apparent that another aspect of gardens that continued into the Byzantine era was an understanding of the beneficial effects of gardens on ones health and life, with a focus on views, light and air (although here one could argue that this seems a strange thing to "lose" and that the Byzantine populace certainly would have been able to figure this out for themselves)[12]. The reliance on classical knowledge surrounding all things agricultural and horticultural in Late Antiquity in the East can be seen in the fact that in the sixth century, when the citizens of Honoratae wanted to present a gift to Anicia Juliana, an imperial lady, the book they chose was an herbal, now known to us as the Vienna Dioscorides[13]. Of course, one major difference from their pagan predecessors exists in the fact that the Byzantines could also cite biblical exhortations to eat "the fruit of the labour of your hands" (Psalm 128:2) and "plant gardens and eat their produce" (Jeremiah 29:5).

In terms of the institution or tradition of the hunt, the symbolism and pure enjoyment of this activity were also retained by the Byzantines. The fifth century provides evidence of hunts organized on family estates[14]. Later centuries were to see the hunt become an integral part of imperial rhetoric and symbolism[15].

[5] LITTLEWOOD 1997, 16.
[6] WRIGHT 1980, 3:77–80, at 79; see also, LITTLEWOOD 1997, 16.
[7] The most useful discussion of the location and appearance of the gardens and parks of Constantinople is MAGUIRE 2000.
[8] LITTLEWOOD 1997, 17 and 33 with further references. The author also provides further examples on these pages.
[9] BRUBAKER, LITTLEWOOD 1992, 230.
[10] MAGUIRE 1994, 181 and 187–93; LITTLEWOOD 1997, 21. In addition, see LITTLEWOOD 1997, 18, for the notion that in early sixth century, at least, the Vandals of North Africa had absorbed Roman ways, including the use of gardens as an "assertion of imperial might", with further references.
[11] MAGUIRE 1994, 189–91, with further references.
[12] LITTLEWOOD 1997, 23 and 38; MAGUIRE 1994.
[13] LITTLEWOOD 1997, 17. This occurred shortly after AD 512.
[14] ROSSITER 1989, 103 with further references.
[15] MAGUIRE 1994, 191–3.

In this respect, Henry Maguire has noted that the beasts that served as game could also represent either the emperor's internal demons or his external enemies[16].

The further spread of the classical Mediterranean attitudes, if not necessarily the exact form and function of these gardens, to the early Islamic world (especially the Umayyad dynasty) might seem surprising at first considering the differences in culture, geography, and in some cases, even climate. However, the following observation by Oleg Grabar that these gardens, especially when woven into a palatial context, would have been simply part of an international "class culture" does seem to explain what we see today when studying the various sources.

> The realm of the prince as it was made visible to others was, at this time, as unaffected by the faith as the prince's private palaces were earlier. Herein lies a key aspect of princely culture and hence of princely art. Because it was not modified or controlled by the faith and because it took its themes and practices from the enormous body of habits and motifs inherited from the classical and Near Eastern traditions, it created a system and vocabulary that could be understood by all comparable princely realms[17].

Although there is as yet no evidence for it in the Late Antique period, a striking, though unfortunately also somewhat ephemeral area of continuation exists as far forward as the Middle Byzantine (843-1204) and Late Byzantine (1261-1453) periods. This is not a particular type of garden per se, but nevertheless fits under the larger umbrella of managed gardens, and is important for understanding the symbolism associated with them, especially in the later periods. In continuing the tradition of imperial triumphs, we have several texts that described the use of cut branches and flowers to prepare the city of Constantinople for the emperor's victorious entrance[18].

Although ephemeral and therefore perhaps out of reach for us visually, the descriptions that survive remind one of the transformation that occurs on most university campuses around the times of homecoming, graduation, or parents' weekend when hundreds of flowers can appear seemingly out of nowhere and literally turn the campus into a living garden. For example, in order to set the stage for a late ninth-century triumph of Basil I in Constantinople, the route was garlanded "with laurel and rosemary and myrtle and roses and other flowers…[and in addition, the ground] was completely covered in flowers"[19]. At a later date, Constantine IX was maligned for his constant manipulations of gardens and the landscape as he transformed hill into flowering field, to the amazement of some commentators[20].

Of course, the eastern Mediterranean from the fourth through seventh centuries was a different world than Republican or Imperial Rome and differences in the approach to gardens did exist as well. One thing that seems very striking and that perhaps provides an avenue of inquiry to be tracked backward into the Classical period (where examples such as Hadrian's Villa do exist) is the almost complete integration of palace and garden into a coherent unit, as opposed to two separate, yet adjoining parts. Another is that eventually, although it is not certain when, we see the influence of gardens from the Persian tradition appearing in both Byzantine and Islamic gardens in the way they were designed and even in the way that they were planted[21]. And although we must remain vigilant in the use of *ekphrases* as sources of information, the literary descriptions of gardens can often be traced back to Classical and biblical models. However, it should also be noted that in practice it does seem that the Byzantines were not simply passive recipients of the Classical heritage. There is evidence, for example, that the gardens of the elite were frequently the setting for various agricultural experiments[22].

[16] MAGUIRE 1994, 192.
[17] GRABAR 1973, 171–3, at 173. Page references will differ in different editions of this book.
[18] MAGUIRE 1994, 186–7.
[19] As quoted in MAGUIRE 1994, 187. The triumph occurred in 878.
[20] MICHEL PSELLOS 1928, 2:56–63 and 70–1 for the passages and their context.
[21] LITTLEWOOD 1997, 25–33.
[22] BRUBAKER, LITTLEWOOD 1992, at 214 and 216.

I would like to conclude with what I hope will not be too naïve of an offer. Until this point, everything I have mentioned represents a (still somewhat nebulous due to the perceived lack of sources) beginning for Late Antique, early Byzantine and early Islamic gardens and the benefit of looking into this subject would seem to flow only in one direction. But perhaps there are some areas where such an investigation can "flow backwards" so to say, and offer some information of relevance for the ancient gardens as well. One area may be the striking coherence and unity of landscape and architecture mentioned above. Despite the continuous efforts of the other authors in this section to rectify the situation, it seems that this is still a realization many scholars have yet to accept for the Roman period. Another area may be in the focus on non-elite houses. Such a focus is forced upon us due to the nature of the archaeological sources for the later periods and the nature of Roman settlement in the eastern empire. For example, rural villages such as those studied in northern Syria may also offer insights for both periods[23]. One such insight is what seems to be a focus on the productive side of garden estates and plantations in the post-second century period, one that can perhaps be applied to more ancient examples with good harvest[24]. The medicinal gardens of hospitals and monasteries may also prove fertile[25]. This is something that is often lost in the focus on pleasure, although the latter is perhaps something that is timeless and without necessary fast and hard beginning or end, which is a state of being that I am hoping the reader will consider for the Roman garden as well.

James G. Schryver
University of Minnesota, Morris
Humanities Building 104
600 E 4th Street
Morris, MN 56267
USA
E-mail: schryver@morris.umn.edu

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[23] ROSSITER 1989, 101–110.

[24] An example of this is the way in which Anthony Littlewood divided his recent discussion of the current scholarship concerning Byzantine gardens into two sections on pleasure gardens and productive gardens. See LITTLEWOOD 2002a.

[25] For a discussion of Byzantine monastic horticulture, see TALBOT 2002; HIRSCHFELD 1992.

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THE HISPANO-ARAB GARDEN
ITS PHILOSOPHY AND FUNCTION

By James Dickie

The literary genres of *nawrīyāt* and *rauḍīyāt*, the description respectively of flowers and gardens, figure amongst those most cultivated by Hispano-Arab poets, and it would be superfluous to identify all the poets who found in a garden the most congenial source of their inspiration. One case must suffice: that of Ibn Khafāja, styled *al-jannān* 'the gardener' on account of the predilection he showed for this genre. Just as the full understanding of Graeco-Roman poetry is impossible unless the reader know what such plants as laurel, ivy, and myrtle signified to the ancients, the study of Arab gardening is important in superlative degree for the correct interpretation of Arabic poetry. But this is not the only point of contact between gardening and literature: for, by strange coincidence, the normal critical procedure used in analysing a work of literature, namely to consider it under its dual aspect of form and content, is equally applicable to garden design and we purpose here first to discover the plan or form of the Hispano-Arab garden and then to examine its content or flora.

Unfortunately the evidence on which an authentic reconstruction of the Andalusian garden could be based is tenuous in the extreme. The numerous allusions in poetry to flowers and fountains rarely or never specify the context in which they appeared. The gardens of the Alcázar at Seville, all too frequently eulogized as a fusion of the Arab and Spanish traditions, are neither the one nor the other but represent the typical Italian garden introduced into Spain during the Renaissance. The gardens of the Partal in the Alhambra at Granada enjoy no more antiquity than 40 years, and with their box-edging, ubiquitous ivy, and enormous Versaillesque perspectives in the style of Le Nôtre, are diametrically opposed to the Muslim sensibility with its emphasis on the intimate and the within. There remain, nevertheless, certain invaluable archaeological data which, combined with the literary descriptions and the evidence furnished by Muslim garden design outside Spain, permit the reconstruction in plan and in detail of the Hispano-Arab garden.[1]

The Arab love of gardens stems from the fear and antipathy which the Oriental has always felt for nature in its hostile aspect of the desert which signified for him death, aridity, and the resort of ogres and evil spirits.[2] The

[1] The only comprehensive study of the Islamic garden ever undertaken is, to the best of my knowledge, contained in a paper ('Les jardins de l'Islam') read by Georges Marçais to the Association of Muslim Students at Algiers in 1941 and subsequently published in *Education algérienne*, Alger-Baconnier, 1941, but more accessible in *Mélanges d'histoire et d'archéologie de l'Occident musulman*, Algiers, 1957, I, 233–44. More limited in scope despite its title is Annamarie Schimmel's '*Al-Junaina. Al-azāhir wa 'l-basātīn fī ḥaḍārat al-Muslimīn*', *Fikr wa-Fann* (Hamburg), I, 2, 1963, 45–61.

[2] The Arab attitude to the desert is more ambiguous and complex than this, but in the question of gardens only the negative side of this ambivalence concerns us.

Qur'ān abounds in accounts of Paradise (*al-janna* 'the Garden')[3] in the form of a garden with plenteous shade and with water everywhere: 'And as for those who believe and do righteous works We will cause them to enter gardens underneath which rivers flow, to dwell therein eternally: they shall have purified companions, and We will cause them to enter abundant shade'.[4] Indeed one can understand neither the Islamic garden nor the attitude of the Muslim toward his garden until one realizes that the terrestrial garden is considered a reflection or rather an anticipation of Paradise.

This being the case it is no cause for wonder that the Islamic garden should embody cosmological concepts. In Persian ceramics approximately datable to 4000 B.C. the world—represented by a plaque or bowl—appears symmetrically divided into four zones by two axes forming a cross; at the point of intersection a pool is depicted: in other words, there at the focal point of the world the Spring of Life breaks surface.[5] This iconography, closely connected with the 'mandala' of Buddhist iconography, expresses a vision of the universe, a life-symbol which, by virtue of its adoption by the conquering Arabs, was distributed throughout the entire extent of their Empire. In this manner the Iranian garden came to constitute the prototype of the Islamic garden. A garden is, of course, one of the commonest life-symbols, and a garden designed in accordance with this archetype (using the term in its Jungian connotation of 'race memory') constitutes the world in microcosm. The word *firdaus* stands for both garden and Paradise; in like fashion *rauḍa* indifferently signifies garden and mausoleum, indicating that the garden frequently served as a burial-place where the owner, inadequately satisfied with the pleasures it had given him whilst he lived, wanted to continue enjoying them even in death and where—symboli-

[3] Analogically the etymology of 'Paradise' in European languages reveals the primitive meaning of the word as 'garden', since it is derived from the Greek παράδεισος (of Persian derivation and signifying pleasure-park or garden) which is the word used in the Septuagint for the Garden of Eden.

[4] Sūra IV, verse 57. I have not consulted the commentators on the recurrent phrase in the Qur'anic descriptions of Paradise, *tajrī min taḥtiha al-anhār* 'underneath which rivers flow', but two interpretations seem possible. Quite evidently it refers to a Paradisal mount either washed by rivers at the foot, as Milton (*Paradise lost*, III, 30–1) says:

> 'Thee, *Sion*, and the flowrie Brooks beneath,
> That wash thy hallowd feet, and warbling flow,'

or cooled by subterranean rivers, as in the following account, once again quoting from *Paradise lost* (IV, 223–30):

> 'Southward through *Eden* went a river large,
> Nor chang'd his course but through the shaggie hill
> Passd underneath ingulft, for God had thrown
> That Mountain as his Garden mould high rais'd
> Upon the rapid current, which through veins
> Of porous Earth with kindly thirst up drawn,
> Rose a fresh fountain, and with many a rill
> Waterd the Garden. . . .'

Howbeit, the image is an archetype which recurs constantly whether in literature or scripture.

[5] cf. Donald M. Wilber, *Persian gardens and garden pavilions*, Rutland, Vermont, and Tokyo, 1962, 19. This book is incomparably the best work published on any aspect of Islamic gardening.

cally—he had already entered into Paradise.[6] The custom of interment in a garden rests on an implied reciprocity between heaven and earth, a reciprocity whereby natural reality is plastically transformed into its supernatural counterpart. In these cases it would be no exaggeration to affirm that the garden's role is eschatological.[7] In the light of this the well-known *ḥadīth*, ' Between my tomb and my chair (i.e. pulpit) there is a garden (*rauḍa*) which is one of the gardens of Paradise ', acquires fresh significance.[8]

Evidence from non-Spanish sources makes clear the basic organization of the Muslim garden: a watercourse flanked with paths forms the main axis by which a rectangular enclosure is divided and in relation to which the principal elements are distributed.[9] At right angles to this axis there are one or more secondary axes which may not necessarily carry water but simply be transversal walks, forming points of division or communication. In the case of the principal axis water is indispensable inasmuch as it is used for irrigation purposes.

Of literary sources we have found only two: one a Cordovan text of the

[6] The following verse from the epitaph of the Granadine Sultan Yūsuf III (*shāhid* preserved in the Alhambra Archaeological Museum; transcription in Lafuente y Alcántara, *Inscripciones árabes de Granada*, Madrid, 1860, 60, and in Lévi-Provençal, *Inscriptions arabes d'Espagne*, Leyden and Paris, 1931, 172) makes clearer the aesthetics of this cadre better than any amount of description: ' May rainclouds water his grave and revive it, and may the moist garden carry to him its fresh perfume '.

[7] The custom was very widespread and found perhaps its fullest expression in Persia and the Muslim regions of India. The most recent example that I know of is the funerary garden laid out in the Urdu Park at Delhi for the interment of Abu 'l-Kalām Azād, where the famous Indian theologian lies buried at the intersection of two asymmetrical axes. As far as Spanish practice is concerned by far the best account may be found in Torres Balbás, ' Cementerios hispano-musulmanes ', *Al-Andalus*, XXII, 1, 1957, 133, where various references are given. The practice of siting monuments and even tombs within a garden so as to evoke sensations of not unpleasing melancholy in the beholder was revived by the sentimental eighteenth century, above all in France where such mausolea proliferated in the romantic ' jardin anglais '. In addition to the well-known case of Rousseau's burial in the park at Ermenonville other examples involving less celebrated personalities are found at Méréville, Morfontaine, Plessis-Chamant, and Maupertius. But this morbid indulgence is not really comparable with the Islamic notion of the funerary garden as forming the dwelling-place of the deceased, an attitude which finds practical expression in the custom of burying the dead in close proximity to a saint's grave precisely in order that they might partake of the sanctity of his presence and benefit from the *baraka* or spiritual emanation exuded by his tomb.

[8] In ' La Rauda de Medine, cadre de la meditation musulmane sur la destinée du Prophete ', *Bulletin de l'Institut Français d'Archéologie* (Cairo), LIX, 1960, 241–72 (reprinted in *Opera minora*, Beirut, 1963, III, 286–315), Massignon, with the extraordinary penetration characteristic of all his work, argues that the organization of the Rauḍa or Mausoleum of the Prophet at the Madīna Mosque responds to abstract tendencies in Muslim art to provide a *schema* or framework for religious meditation and even for mystical sublimation.

[9] A fuller account than is possible in this brief essay could not afford to neglect the possibility of Roman influence, particularly in Spain where the Roman irrigation system was still in use when the Arabs arrived in 711. One analogy is, however, too important to be overlooked: the axial watercourse of the Perso-Arab garden corresponds closely to the ' euripi ' of the Romans, notably in the Garden of Agrippa at Rome and in that of Loreius Tibertinus at Pompeii. Parallel material, yielding points of comparison as well as of contact between the Perso-Islamic and the Egypto-Hellenistic garden traditions, can be found in Jack Lindsay's *Leisure and pleasure in Roman Egypt*, London, 1965, 248–346.

eleventh century and the other a Granadine of the fourteenth. These descriptions, separated by three centuries, demonstrate that the Arab garden underwent no significant changes in the interval. The first text describes the garden in Cordova known as Ḥair al-Zajjālī where the famous poet Ibn Shuhaid was buried beside his friend the vizier Abū Marwān al-Zajjālī whose private property the place had been. ' This *ḥair* ', writes Ibn Khāqān, ' is one of the most marvellous, most beautiful, and most faultless places [of pleasure]. Its courtyard is of pure white marble ; a stream traverses it, wriggling like a snake. There is [also] a basin into which all waters fall. The roof [of the pavilion] is decorated in gold and blue and in these colours also are decorated the sides and various parts. The garden has files of trees symmetrically aligned and its flowers smile from open buds. The foliage of the garden prevents the sun seeing the ground ; and the breeze, blowing day and night over the garden, is loaded with scents .... Abū 'Āmir [ibn Shuhaid] enjoyed therein spells of well-being and rest both in the morning and afternoon. Fate gave him at that time whatsoever he desired, and the pleasures of sobriety and inebriation alternated with each other in his experience. He and the proprietor of the garden who is buried alongside him were companions in the youthful pursuit of the gratification of the senses and allies in joy.' [10]

Albeit vague and jejune this description constitutes, nevertheless, a key document. Apart from indicating that a garden was viewed as a place suitable for voluptuousness the passage gives prominence to the axial watercourse : ' wriggling like a snake ' refers in all probability not to the plan but to the section, that is to say, at the point at which it reached the sunken, marble-paved courtyard in the centre, the water-channel would descend in steps until it reached the new level. There the water fell into a central basin over which would stand almost certainly the pavilion described. Parallel with the watercourse were rows of fruit-trees so that the enclosure would be decorative in the centre but becoming increasingly functional toward the periphery, forming thus not a garden (which is a Renaissance concept) but a ' hortus ' in the Roman and Levantine sense. In the Alcazaba of Málaga there survives a garden pavilion contemporaneous with this account : lobulated arches which interlock in pure caliphal style support a wooden ceiling.

Our second text is from Ibn Luyūn's poem on agriculture : [11]

' With regard to houses set amidst gardens an elevated site is to be recommended, both for reasons of vigilance and of layout ;

and let them have a southern aspect, with the entrance at one side, and on an upper level the cistern and well,

[10] *Qalā'id al-'iqyān*, Būlāq, 1283/1866–7, 153. For the location of this garden see *Al-Andalus*, XXIX, 1964, 293–4, where we studied it in the context of Ibn Shuhaid's biography.

[11] *Kitāb ibdā' al-malāḥa wa-inhā' al-rajāḥa fī uṣūl ṣinā'at al-filāḥa*, in Lerchundi and Simonet, *Crestomatía arábigo-española*, Granada, 1881, 136. The poem on agriculture, hitherto unpublished save in excerpts, has been edited with translation into Spanish by Sta. Joaquina Eguaras, and should appear shortly in the series of publications edited by the Escuelas de Estudios Árabes of Madrid and Granada.

or instead of a well have a watercourse where the water runs underneath the shade.

And if the house have two doors greater will be the security it enjoys and easier the rest of its occupant.

Then next to the reservoir plant shrubs whose leaves do not fall and which [therefore] rejoice the sight;

and, somewhat further off, arrange flowers of different kinds, and, further off still, evergreen trees,

and around the perimeter climbing vines, and in the centre of the whole enclosure a sufficiency of vines;

and under climbing vines let there be paths which surround the garden to serve as margin.

And amongst the fruit-trees include the [common] grape-vine similar to a slim woman, or wood-producing trees;

afterward arrange the virgin soil for planting whatever you wish should prosper.

In the background let there be trees like the fig or any other which does no harm;

and any fruit-tree which grows big plant it in a confining basin so that its mature growth

may serve as a protection against the north wind without preventing the sun from reaching [the plants].

In the centre of the garden let there be a pavilion in which to sit, and with vistas on all sides,

but of such a form that no one approaching could overhear the conversation within and whereunto none could approach undetected.

Clinging to it let there be [rambler] roses and myrtle, likewise all manner of plants with which a garden is adorned.

And this last should be longer than it is wide in order that the beholder's gaze might expand in its contemplation.'

Although this account reveals a garden more utilitarian in character than the Cordovan example it allows us to amplify our conclusions as well as confirming the presence of all the aforementioned features. The pavilion should be located precisely in the centre thereby crowning with its cupola the intersection of the two axes and should be decked with climbing plants.[12] The allusion to vine-trellises to shade the paths from the sun proves that the Arabs continued the Roman tradition of the pergola, at least in the form of the 'berceau' or covered walk. The enclosure—recommends Ibn Luyūn—ought to be 'longer than it is wide' in order that the central kiosk may give on extensive vistas, which is to say the garden must be rectangular in outline. Of other flowers the author refers only to myrtle, and for a long time I thought that this shrub,

[12] Here archaeology steps in to confirm Ibn Luyūn: the excavation of the Patio de la Acequia in the Generalife, hereafter referred to, laid bare the bases of columns which must have supported a dome over the central crossing.

being an evergreen, would also be that intended to shade the pool against evaporation (verse 5, above), but had no proof until confirmation came in the form of three verses by Ibn Zamrak: [13]

'O Palace of Genil,[14] full is your abode and naught but beauty does your garden hold.

How lovely is your pool! On it the East Wind weaves coats of mail beneath the banners which the trees extend;

and the myrtle whose down surrounds it is plea enough for anyone whose passion is for down'.[15]

The introduction of this shrub to line the pool in the Courtyard of Comares in the Alhambra in the late nineteenth century by the architect Contreras was, therefore, a happy accident. Starting out from the axial canal there should, in the foreground, figure the flowers, in the mid-distance climbing vines and fruit-trees whilst in the background would stand fig-trees as wind shelter.

We have left till the end the archaeological testimony if only to avoid falling into the trap of which García Gómez bids us beware, namely, that of 'taking as premiss the present structure of oriental gardens'.[16] Notwithstanding, this observation no longer has the force it once enjoyed now that excavation has disclosed in the Patio de la Acequia of the Generalife an authentic Arab garden of the Middle Ages. Although the immediate motive was to repair damage caused by the fire of 1958, the archaeologist Jesús Bermúdez not only found the pavement of the Arab paths, revealing thereby the primitive cruciform design of the garden, but, underneath the accumulated debris of almost five centuries, located the primitive level of the parterres (50 cm. below that of the paths) and even, pierced in the flanking paths of the watercourse, the outlet holes which made feasible the irrigation of the flower-beds.[17] Now, for some obscure reason, other authorities have disfigured once more the Patio de la Acequia, sealing the outlet holes, burying the Arab level under half a metre of earth and debris as before, and planting once more upon this false surface the no less false plants unknown to the Arabs. But the plan, unaffected by these changes in the garden's third dimension, continues to proclaim a c͟hahār bāg͟h, or quadripartite garden, such as Bābur might have laid out at Āgra or S͟hāh ʿAbbās at Iṣfahān.

[13] *apud* al-Maqqarī, *Nafḥ al-ṭīb*, Cairo, 1949, x, 80, ll. 15–17.

[14] This palace still exists in the outskirts of Granada, albeit in a deplorable state of dereliction. Still extant also is the large rectangular pool (*baḥr*) alluded to by the poet: measuring 121 × 28 metres, before it was filled in for cultivation, it must have been spacious enough to invite comparison with the *daryāc͟ha* or 'little sea' type of garden common in Iran.

[15] I prefer the interpretation of this verse suggested to me by my colleague Dr. J. D. Latham to that of Dr. E. García Gómez (*Cinco poetas musulmanes*, Madrid, 1944, 247). The verse indicates that homosexuality, being something reprehensible, requires extenuation, which in this case, the dark beauty of the myrtle's foliage, so reminiscent of down on the cheek of a youthful catamite, supplies.

[16] *Silla del Moro*, Madrid, 1948, 111.

[17] See 'El Generalife después del incendio de 1958', *Cuadernos de la Alhambra*, 1, 1965, 9–39, whence we reproduce the excellent plan by Sr. Jesús Bermúdez (fig. 1).

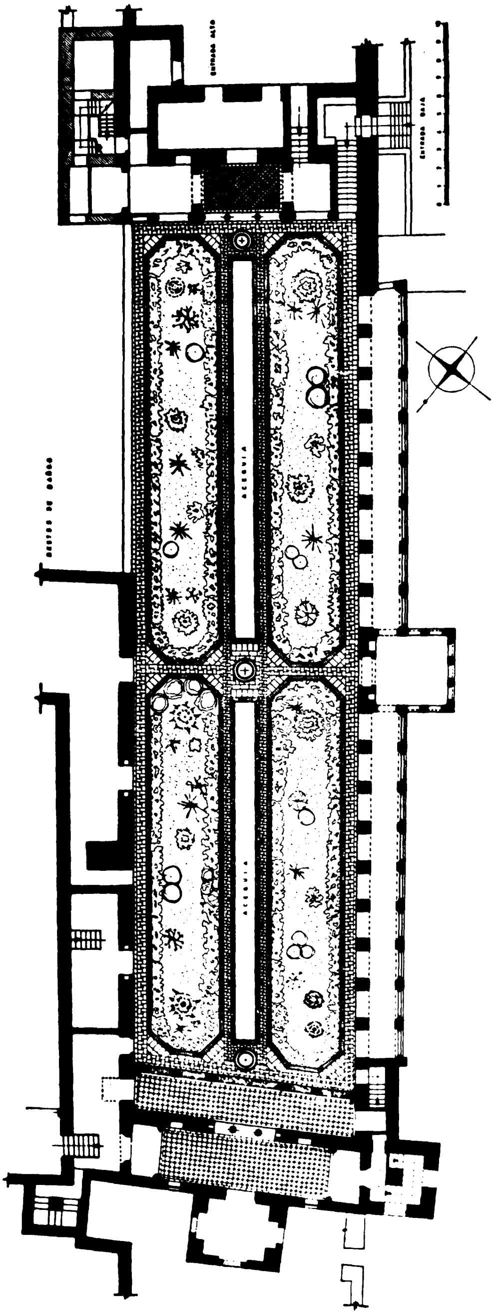
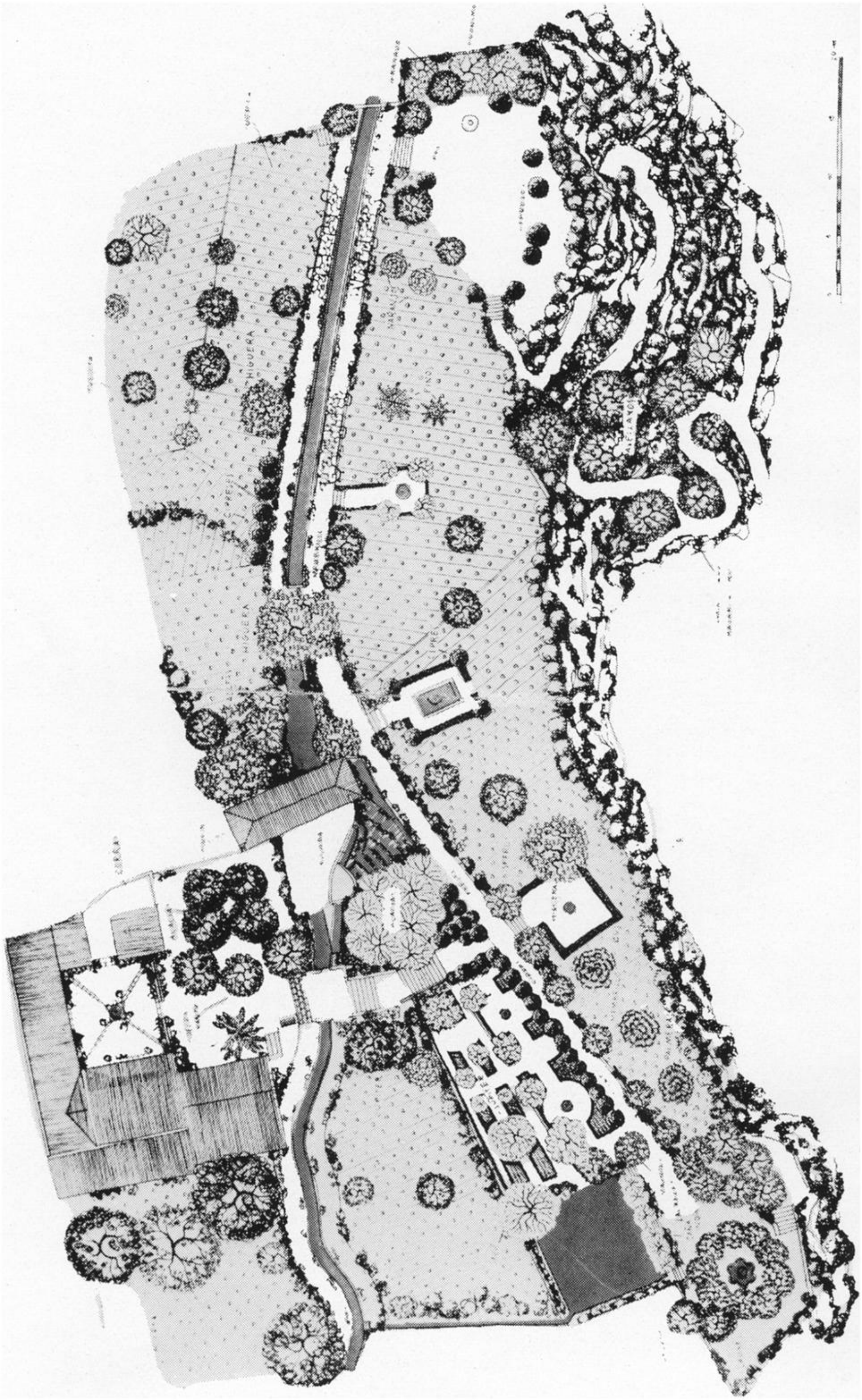


FIG. 1. Plan of the Generalife showing the medieval garden recently discovered.

[*Courtesy the Patronato de la Alhambra*



[Courtesy Sr. Francisco Prieto-Moreno

FIG. 2. Plan of garden at Vélez Benaudalla.

Almost the only other Arab garden to survive [18] is the so-called Courtyard of the Lions in the Alhambra and here also, when the architect Cendoya had the courtyard excavated in order to reinforce with concrete the foundations of the surrounding buildings, the stratification of the soil was upset; however, Manuel Gómez-Moreno, who witnessed the operation, has said that the Arab level was 80 cm. below the present one. This disparity in level between the parterres and the paths had more than one purpose: firstly, it lent added prominence to the geometrical character of the enclosure; secondly, the vegetation could never attain such a height as would allow it to interfere with the architecture; and lastly, it converted the garden into a floral carpet where a person walking on a path at the level of the blossom had the illusion of treading upon a carpet woven with flowers instead of threads. The elevation of the walks so as to create a sequence of sunken flower-beds is particularly conspicuous in Indo-Islamic gardens, as, for instance, in the S̲h̲ālimār Gardens at Lahore or in the funerary gardens of the Tāj Maḥall at Agra and Akbar's Mausoleum at Sikandara; it still persists as an essential feature of almost any garden in Morocco.[19] The Palace of the Lions was built in order, we are told, to beautify a garden, and there is no need to postulate a hypothetical origin in the Christian cloister to explain its fundamental difference from other Naṣrid palaces—all versions on a grander scale of the typical Granadine Arab house—but its origin is rather in the Persian garden as is clearly shown by the seven superimposed axes of symmetry in accordance with which the columns of the colonnades are disposed around the four sides of the courtyard.[20] Too well known to require description, the fountain the lion-supporters of which we now know to be of eleventh-century date, occupies the point of confluence of two water-axes which, before they converge, cool the surrounding rooms in which they rise as jets and trickle in narrow conduits down steps into the courtyard to be returned to the fountain and spewed forth again from the lions' maws.

These two examples, due to their peculiar situation, show how the architecture, entering into and influencing the garden, has ended by imposing its own personality, but the norm was doubtless much less formal. Both kinds of garden were found in juxtaposition in the Generalife: the formal represented by the Patio of the Acequia and the informal by the gardens on the upper level, gardens of which unfortunately not a vestige remains but for the water-staircase

[18] The possibility of there being another Arab garden under the present Parador de San Francisco (inside the walls of the Alhambra) cannot be excluded, because the courtyard of this hotel is still crossed by the watercourse of the Muslim palace which anciently occupied the site. Nor can mention be omitted in this context of the immediate predecessor of the Court of the Lions, the ruined palace known as the Castillejo in the Vega of Murcia, which dates from the twelfth century. See Torres Balbás, 'Patios de crucero', *Al-Andalus*, XXIII, 1, 1958, 176–8.

[19] On the Indo-Islamic garden see C. M. Villiers-Stuart, *Gardens of the great Mughals*, London, 1913, *passim*. Some useful data on Moroccan gardens are contained in Jean Gallotti, *Le jardin et la maison arabes au Maroc*, Paris, n.d. [but *c.* 1926], 2 vols.

[20] See Georges Marçais, 'Remarques sur l'esthétique musulmane', *Annales de l'Institut d'Études Orientales* (Algiers), IV, 1938, 64–9; reprinted in *Mélanges d'histoire et d'archéologie de l'Occident musulman*, Algiers, 1957, I, 99–102.

which, covered by its vault of laurel-branches, corresponds to the ' watercourse where the water runs underneath the shade ' of Ibn Luyūn.

By what one can only describe as little less than a miracle, in Vélez Benaudalla, between Granada and Motril, a garden of Arab date has been preserved which, its rather utilitarian nature notwithstanding, presents an invaluable testimony. The plan shows how the prototypal Arab garden, of which this represents a free interpretation, has suffered severe modifications on being adapted to the exigencies of the terrain.[21] For this reason the Vélez garden is notable rather for its asymmetry and picturesque properties than for the elements we have been analysing in this study. Of these elements the one most immediately apparent is the central axis constituted by the watercourse to the importance of which there contribute pergolas (exactly as Ibn Luyūn recommends). In the orchard are several fountains whence the water bursts forth under gravitational pressure by virtue of the inferior level they occupy with regard to the axial canal. This last runs along the spine of the terrain, thus enabling this garden to dispense with the disparity in levels necessary elsewhere, because the fall in ground level on either side of the canal suffices for the irrigation. The transversal axis, here dislocated from the centre, connects the house with the garden by means of a bridge and steps. The pool forms the starting-point of an oblique axis whose alignment determines the disposition of the decorative zone of the garden, and, by prolongation, this axis meets the main one precisely at the point where the latter would normally have been bisected by the transversal axis.

Up to this point we have limited ourselves to the form of the Hispano-Arab garden, to the neglect of its content. For the restoration of the primitive planting of the Andalusian garden two alternative methods are possible, one positive and the other negative. The former consists in ascertaining, on the basis of textual sources, which flowers were cultivated in the Arab garden. The negative method operates in the inverse direction ; it is applied by excluding from the current catalogue of Iberian flora all items imported after the Fall of Granada in 1492. This importation had two phases : the first as a consequence of the discovery of America in this very year and the second as a result of the discoveries made by botanists such as Robert Fortune in the nineteenth century. The agaves and prickly pears in the Alcazaba at Málaga form, perhaps, the most conspicuous of these anachronisms.[22] By using either of these methods, or both, it ought to be possible to restore to the Arab palaces still surviving in Spain not only the plants of their gardens but also—less tangible but perhaps even more evocative—the perfumes with which these

[21] Acknowledgements are due to Sr. Francisco Prieto-Moreno, on pp. 190–1 of whose book (*Los jardines de Granada*, Madrid, 1952) appears the plan which we reproduce here (fig. 2).

[22] Although these prickly pears are an anachronism there can be no doubt that, in spite of the popular belief that this cactus came to Spain from the American continent, there flourished on the Mediterranean littoral a species known as *Opuntia tuna*, because the German traveller Münzer saw it there in 1494, only two years after the Reconquest. See *Viaje por España y Portugal, 1494–1495*, Madrid, 1951, 29–32.

places overflowed during the Middle Ages. However, in *al-Badīʿ fī waṣf al-rabīʿ* 'Novelties in description of the spring' [23] al-Ḥimyarī (a Spanish Muslim of the eleventh century) lists the names of 20 of the commonest flowers. In the sequence of their appearance these are: *ās*: myrtle (alternatively 'arrayán' in Spanish from the other Arabic name *raiḥān*) [24]; *yāsimīn*: white garden jasmine (whose role in Arab gardens was to relieve the monotony of whitewashed enclosure walls); *zayyān*: yellow wild jasmine; *bahār*: narcissus (rival of the rose for the affections of the poets, this is the pheasant's eye narcissus, variegated in white, yellow, and green); *banafsaj*: violet (which, being the favourite flower of Almanzor, was prominent in the gardens of the ʿĀmirīya Palace); *khīrī nammām*: mauve stock; *khīrī aṣfar*: yellow wallflower; *narjis qādūshī*: trumpet narcissus; *ward*: red rose; *sausan*: white lily (a frequent symbol of purity); *khurram*: blue iris; *nailūfar*: water-lily; *naur al-lauz*: almond-blossom; *uqḥuwān*: marguerite or camomile (the petals of which provided the poets with a conceit to describe the beloved's teeth); *shaqir* or *shaqīq al-nuʿmān*: poppy (sometimes these terms denote the red anemone); *naur al-bāqillā'* or *naur al-jirjir*: bean-flower; *naur al-ghāliba*: ivy-flower; *naur al-rummān*: garden pomegranate blossom (the fruit as a symbol of the female breast is a poetic commonplace): and *jullanār*: wild pomegranate blossom (the 'garden' variety is productive, the 'wild' decorative).

Amongst al-Ḥimyarī's omissions Pérès notes six plants featured in other Arabic texts, viz.: *ḥabaq*: basil; *khuzāma*: lavender; *zahr*: orange-blossom; *qaranful*: carnation; *mardaqūsh*: marjoram; and *diflā*: oleander.[25]

But to this catalogue of 26 plants, trees, and shrubs could be added at least 24 more, to wit: *ḥāshā*: thyme; *naʿnaʿ*: mint; *zaʿfrān*: saffron (all three, together with basil and marjoram, above referred to, being herbs used in Arab cuisine); *tarmus*: lupine; *laimūn*: lemon-tree; *rand*: laurel; *karma*: vine; *nakhl*: palm-tree; *qarāṣīya* or *ḥabb al-mulūk*: cherry-tree; *ijjās*: pear-tree; *khaukh*: plum-tree; *tūt*: mulberry-tree; *kharrūb*: carob-tree; *mauz*: banana-tree; *sarw*: cypress; *ṣafṣāf*.: willow (symbol in poetry of the slim figure); *zaʿūr bustānī*: medlar-tree; *shajarat al-safarjal*: quince-tree; *tuffāḥ*: apple-tree; *ṣāb*: colocynth (alternatively 'alhandal' in Spanish from

[23] Pérès's ed., Rabat, 1940. Al-Ḥimyarī's list really totals 21, but we have excluded *zahr al-kittān* 'linen-flower' because this plant was cultivated for industrial purposes only.

[24] The Arabs, like the Greeks and the Romans, were addicted to the beautiful custom of scattering, during and after the funeral, branches of odoriferous shrubs on the grave, in addition to censing it with frankincense or asperging it with rose-water. Münzer (op. cit., 39–40) relates how in Granada he saw the Imām chanting beside a tomb whilst seven women, all dressed in white, scattered thereon branches of myrtle. A funerary garden should, of course, be an aromatic spot, redolent with the spices of jasmine and of myrtle; indeed, to judge from how luxuriantly it flourishes in Andalusian epitaphs, the latter of these must have figured very prominently in those places where the moods of death were so exquisitely captured. But climatic as well as aesthetic factors determined the character of the setting, and in India myrtle gives way to iris, known as 'the graveyard bulb', because it grows only in the shade of tombs away from the Indian heat: a role which accounts for its presence in Mughal iconography.

[25] op. cit., 5. Cf. the same author's *La poésie andalouse, en arabe classique, au XIe siècle*, Paris, 1937, 167–85.

the other Arabic name *ḥanẓala*: symbolizes bitterness); *sh̲ajarat al-tīn*: fig-tree; *tuffāḥat al-jinn*: mandrake (the Satanic plant *par excellence* as shown by its etymology—'apple of the genie'); *sh̲aukat al-yahūd*: acanthus; and probably *qulqas*: colocasia.

Such are the data furnished by the positive method; as far as the negative method is concerned perhaps it would be better left to botanists. It is worth-while indicating that this list, which in no sense pretends to be exhaustive, is not confined to garden flowers properly so called but embraces certain 'wild' flowers and even many food-plants as well as fruit-trees, because the Arab garden was at once flower-garden, kitchen-garden, and orchard all in one. The current, post-Renaissance notion of what constitutes a garden would have been unintelligible to a medieval Arab. As regards the arrangement or disposition of the flowers within the garden probably this differed little, if at all, from that prevailing in contemporary monastic gardens in Europe or in the Persian garden, in both of which cases miniaturists depict the plants as sprouting individually, or in informal groups, from an expanse of turf, whose green background lent depth and resonance to the blossom: the antithesis of the modern habit of mass grouping of blooms in beds cut with monotonous precision in a shaven lawn, where the personality of the flower is erased by the density of its planting.

The differences in psychology between Muslim and European are accurately reflected in their respective garden traditions. The high walls of the Islamic garden prevented its owner being seen from outside and insulated him against the clamour and dirt of the antipathetic life of the streets. There, inside his artificial paradise—the title of Soto de Rojas's famous poem [26] could have been chosen by an Arab—he could enjoy in solitude the voluptuous pleasures produced by different perfumes, colours, and shapes in endlessly varied combinations: in sum, it was a place where the refined sensuality of the Muslim sensibility could find full and perfect expression. But within the European garden tradition there exists a profound dichotomy represented on one hand by Le Nôtre in France and on the other by 'Capability' Brown and Humphry Repton in England. If Versailles conforms to Cartesian criteria, that is to say, the triumph of reason over nature, with man imposing his will upon the external world, and the romantic English landscape-garden symbolizes the unconditional surrender of the human spirit to that same nature (as in Wordsworth), the Islamic garden betrays—in a fashion more ephemeral than the architecture but no less certain—an equilibrium of both elements, the rational and the natural, in a felicitous compenetration where each one supplements the other. The only remaining dimension—the imaginative—was furnished by the architecture, without which no garden was complete.[27]

[26] *Paraíso cerrado para muchos, jardines abiertos para pocos* 'Paradise closed to many, gardens open to few'. It is perhaps no accident that this poet was a native of Granada.

[27] The article by E. García Gómez, 'Primavera de flores árabes', *Vértice*, v, 61–2, 1942, 91 and 100, was not accessible to the author till proof stage. This brief study is a notable analysis of the floral metaphors in al-Ḥimyarī's work.

D. FAIRCHILD RUGGLES

THE MIRADOR IN ABBASID AND HISPANO-UMAYYAD GARDEN TYPOLOGY

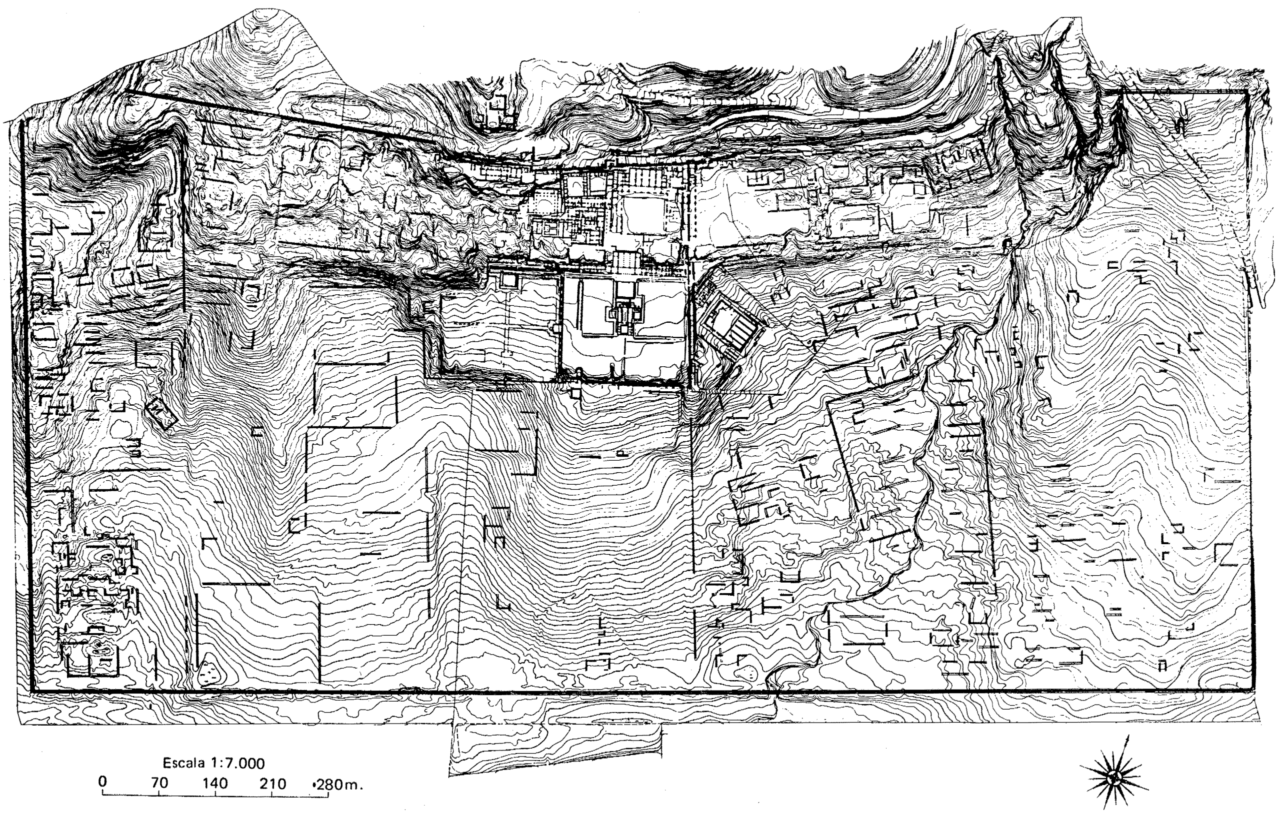
Madinat al-Zahra᾽,[1] the most outstanding example of Hispano-Umayyad palace architecture, was built on the slope of a mountain west of Cordoba in order to exploit the views this elevated site offered. Along with the ring of suburban palaces surrounding the Umayyad capital of Cordoba, Madinat al-Zahra᾽ has often been compared to Abbasid Samarra, a 35-kilometer stretch of palaces built in the middle of the ninth century along the Tigris River outside of Baghdad.

When the Umayyad caliphs in Syria were overthrown by the Abbasids in the middle of the eighth century, the surviving Umayyad claimant to the caliphate fled to al-Andalus and established a kingdom with Cordoba as its capital. In addition to urban building projects such as the monumental mosque, the Umayyad princes built palatial villas, called *quṣūr* (sg. *qaṣr*) or *munan* (sg. *munya*), in the countryside around the city. One of the last of these, Madinat al-Zahra᾽, was a city in its own right.

Madinat al-Zahra᾽ is located seven kilometers west of Cordoba. It was begun in 936 by ʿAbd al-Rahman al-Nasir; construction continued throughout his reign and that of his son al-Hakam. At the latter's death in 976, his vizier al-Mansur seized power from al-Hakam's son, the child-prince Hisham, and began to build his own palatial estate on the other side of Cordoba, calling it by the strikingly similar name of Madinat al-Zahira. Al-Razi and al-Maqqari list some thirty palaces, not all of them caliphal constructions, that were built on the outskirts of Cordoba.[2] Such a figure puts Madinat al-Zahra᾽ in a new perspective: it was not an entirely unique city built on the personal whim of one caliph, but was part of a longer Islamic building tradition that had been introduced to Spain several centuries earlier. Beginning with al-Rusafa, built by ʿAbd al-Rahman I in the third quarter of the eighth century and situated to the north of Cordoba, *extra muros*, the practice of building suburban recreation palaces was continued by succeeding rulers, members of the aristocracy, and wealthy merchants.

The construction of these palaces came to an abrupt halt in the eleventh century when Madinat al-Zahra᾽, Madinat al-Zahira, and many other palaces were sacked and destroyed in the civil wars signaling the fall of the Umayyad dynasty. They were not rebuilt. The ruined sites were abandoned, and in the following centuries were ruthlessly quarried for valuable building materials until hardly anything remained of their marble columns, pavements, basins, wood, and metalwork. As a result, of these palaces, only the sites of Rusafa, Madinat al-Zahra᾽, and al-Rummaniya have been identified with any certainty, and of the three, Madinat al-Zahra᾽ is the only palace with extensive areas of excavated architecture and gardens. This, together with its monumental size and the importance given to it by Arabic texts, makes it a critical monument for the study of Hispano-Islamic gardens.[3]

That Madinat al-Zahra᾽ was profoundly influenced by Abbasid palace typology is evident when the plan of Madinat al-Zahra᾽ (fig. 1) is compared with two Samarran palaces, the Jawsaq al-Khaqani (fig. 2) of ca. 836 and Balkuwara (fig. 3) built between the years 849 and 859.[4] Both resembled miniature cities, deep within which the caliph and his throne room were located, attainable only via a long route through gates, courtyards, garden spaces, antechambers, and reception halls. In Baghdad, the Abbasid caliphs had begun the process of removing themselves from the populace for reasons of security, emulating the legends of the Sasanian kings. Al-Mansur constructed a huge, planned Round City consisting of a series of concentric defense walls which enclosed rings of residential quarters and in the heart of which were the caliphal palace and administrative quarters. As the caliph removed himself from ordinary interaction with his people, he became a more mysterious and remote figure.[5] When Baghdad became too confining and the unruly behavior of the military troops caused disturbances between the soldiers and inhabitants, the caliph moved his residence to Samarra. There he constructed for himself and his sons monumental palaces which were entered through extensive courtyards and multiple walls with limited points of ac-



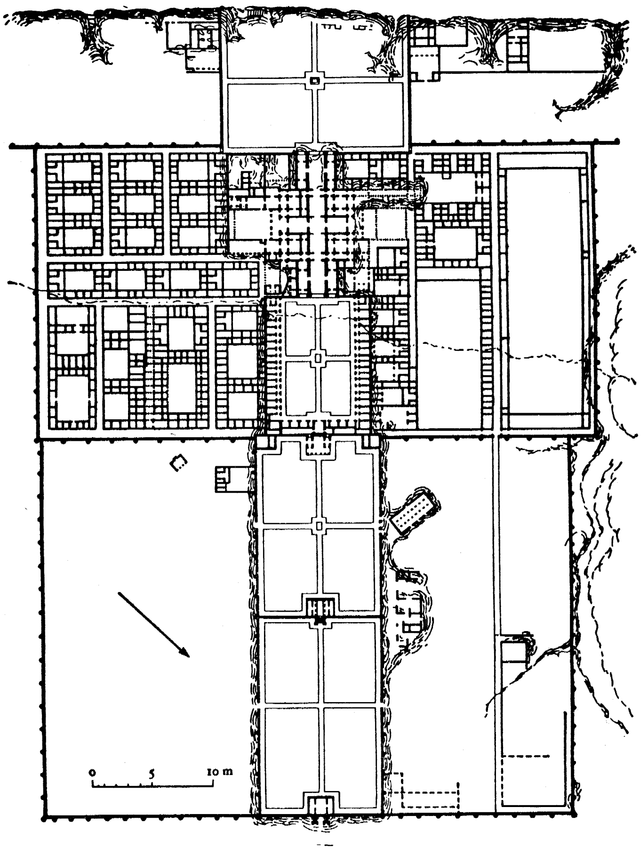
1. Plan of Madinat al-Zahraʾ. (After Lopez Cuervo, *Medina az-Zahraʾ: Ingeniería y Formas.*)

cess, thus satisfying his complementary desires for security and extravagantly luxurious ceremonial spaces.

The plan of Madinat al-Zahraʾ reveals a similar concern for multiple enclosure walls containing a variety of residences, administrative quarters, and ceremonial spaces. Instead of building merely a more elaborate version of the simpler Umayyad suburban palace type already adorning the outskirts of Cordoba, ʿAbd al-Rahman adopted the architectural typology of the Abbasids because it seemed an appropriate vehicle for elevating himself to more exalted status. In a fashion similar to the caliphs of Samarra, the Umayyad caliph removed himself from the urban population of Cordoba, bringing with him those attendants, administrative officials, merchants, and craftsmen deemed necessary for his new role as caliph. He had adopted the caliphal title, Amir al-Muʾminin, or Commander of the Faithful, in 929, six years before embarking on his lifelong building campaign at Madinat al-Zahraʾ, and in proclaiming himself the legitimate Umayyad heir to the caliphate, he upgraded his rank from prince of a small, backwater kingdom on the western fringe of the Islamic world to one of theoretically international stature, contraposing his claim to the caliphate with that of the Abbasids and the Fatimid pretenders. The Abbasidization of the administrative structure of al-Andalus had begun as early as the ninth century and was soon followed by cultural and artistic emulation as well, until by the tenth century, the prince of Cordoba had more in common with his Abbasid rival than with his Syrian ancestors.[6]

The Abbasids had redefined the cultural and political role of the caliph and set new standards of cosmopolitan sophistication in their magnificent Samarran palaces surrounded by poets, musicians, scholars, and artists, and it was the Abbasid style of leadership that ʿAbd al-Rahman adopted rather than the old-fashioned, more restrained version of his Umayyad forebears. Lévi-Provençal wrote:

> Il deviendra un personnage compliqué, mystérieux, et lointain, qu'on n'entreverra plus qu'à des occasions fort



2. Plan of the Jawsaq al-Khanqani at Samarra. (After K. A. C. Creswell, *Early Muslim Architecture.*)

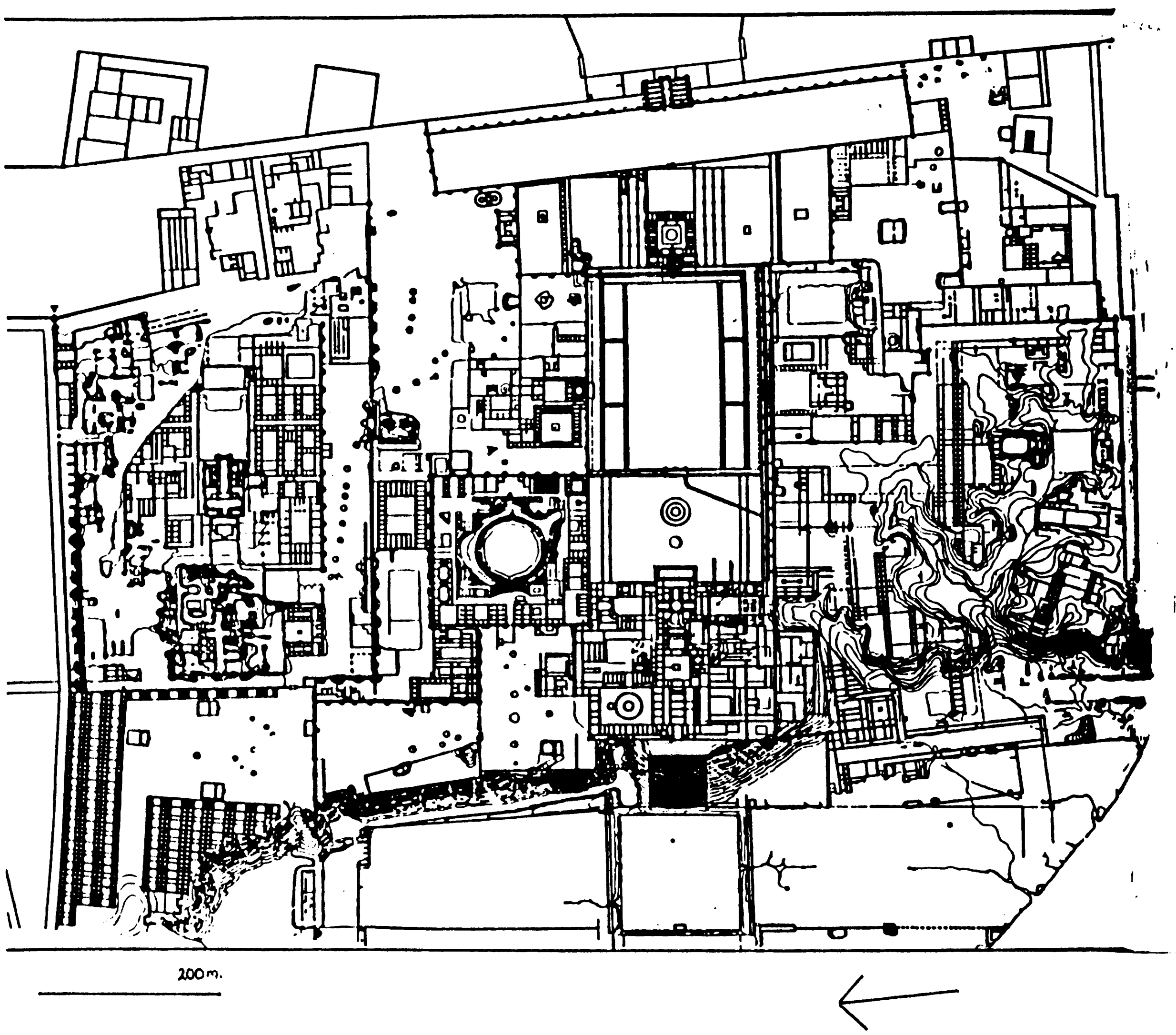
> espacées, lorsqu'il daignera se montrer au milieu d'un éblouissant cortège et recevoir les acclamations du populaire. A ses audiences, seule une classe privilégiée et très peu nombreuse, la *khassa,* sera admise... pour la masse de ses sujets, ʿAbd al-Rahman al-Nasir sera de plus en plus [un] maître fastueux et quasi-inaccessible....[7]

Topographically as well, Madinat al-Zahraʾ followed the precedent set at the Jawsaq and Balkuwara palaces of placement on high ground in order to contrive views toward the exterior landscape. At the Jawsaq al-Khaqani, a view of the exterior landscape was offered from the monumental entrance on the west side of the palace (fig. 4). The long axis around which the palace was organized began from this portal of three iwans which led eastward into the palace proper but opened westward to an enormous flight of steps. The steps rose at a gentle incline seventeen meters above a great square pool flanked by gardens on either side. Between this tank and the bank of the Tigris River further to the west was a small pavilion with views of the tank as well as the river and the landscape opposite. Above, the three-iwan portal and terrace afforded views with two focal lengths: a view onto the pool and gardens where nature was presented on an intimate scale and a panorama of the river and countryside. The terrace and portal functioned as a viewing platform, or mirador, and the pool and gardens as mediating elements through which the rest of the landscape was seen.

Eight kilometers to the south, the Balkuwara Palace also abutted the river, but the Balkuwara's response to landscape was somewhat different from that of the Jawsaq al-Khaqani. Entering on the northeast side, one passed through two outer courts and an inner court leading to a throne room nucleus which opened onto a fourth court, gardens, and the river. The excavator, Ernst Herzfeld, noted that the central rectangular area of the palace was slightly elevated and that the floor level at the Balkuwara rises from court to court with the central throne room at the highest level.[8] Standing in the elevated throne room, the floor of which was on a level with the roofs of the lateral areas, he said one could see over all three courts to the northeast as well as the halls, garden, river, and plains to the southwest, and possibly along the transverse axis toward the Qasr al-ʿAshiq and the tower of al-Qaʾim.[9] From Herzfeld's description, the throne room seems to have functioned as a kind of mirador for surveying the buildings and landscape beyond the palace walls.

A similar interest in manipulating architecture to create predetermined views of the exterior landscape occurred at Madinat al-Zahraʾ. There the buildings were built on three large, stepped terraces cut into the skirt of a low mountain. Commanding a central position on the middle level, the so-called Salon Rico opened from a slightly elevated position onto the Upper Garden (figs. 5 and 6), an extensive walled space measuring approximately 150 by 130 meters and divided into four quarters by paved walkways, the north arm of which was taken up by a large rectangular basin and a pavilion surrounded by smaller basins.[10] The Salon Rico was composed of three naves on column arcades, with side chambers, running perpendicular to a longitudinal hall that opened on its south side toward the garden. Similarly, the garden pavilion which was on level with the Salon Rico was composed of three naves on the same axis as the Salon Rico's naves and fronted by a similar longitudinal hall. The overall effect is of a slightly smaller mirror image of the Salon Rico.

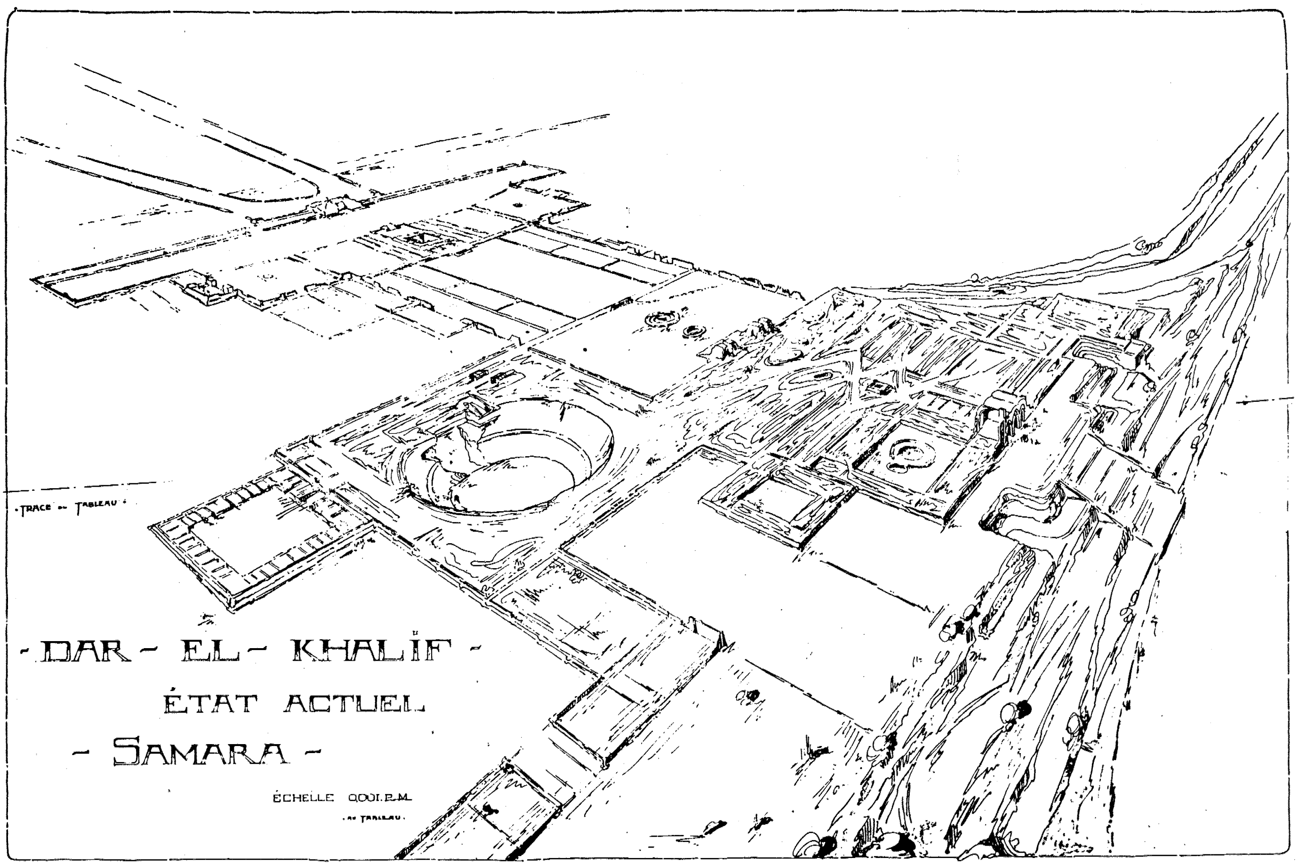
Although what the pavilion's above-ground structure was like is unknown, one can imagine by comparisons



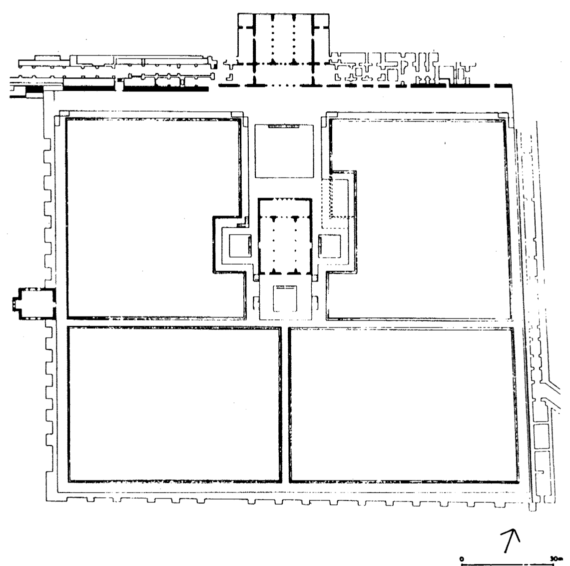
3. Plan of the Balkuwara Palace at Samarra. (After K. A. C. Creswell, *Early Muslim Architecture.*)

with later structures that it opened on all four sides to the garden and water basins, perhaps even giving the illusion that the pavilion was afloat in a tank of water.[11] Within the upper garden's walled enclosure were at least two fixed stations for viewing nature: the Salon Rico, which formed a box-like space, blind on three of its sides but opening southward to permit a carefully directed view of the pavilion, pool, and gardens (fig. 7), and the pavilion which offered four equally calculated views. Three of these views were of gardens and water, and the fourth of the Salon Rico itself and the large pool which, from the vantage point of the pavilion, would have reflected the image of the Salon Rico illuminated by the southern rays of sunlight.

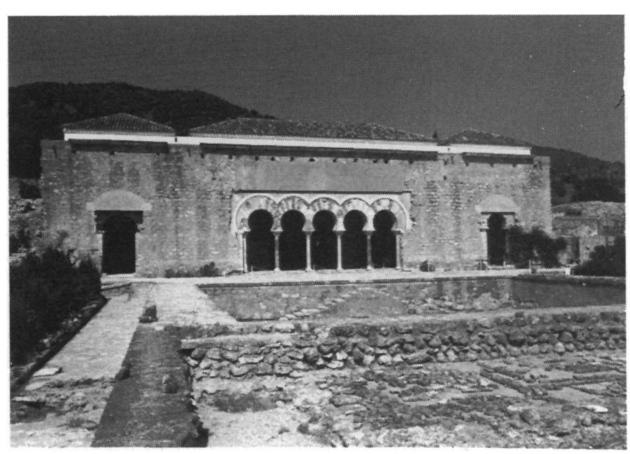
Elsewhere in Madinat al-Zahra᾿, other buildings provided garden and landscape vistas. A former director of Madinat al-Zahra᾿, Félix Hernández Giménez, believed that one of the buttresses bracing the west wall of the upper garden's terrace contained a mirador in its tower which looked across the lower garden, twelve meters below, toward the landscape beyond the walls of the palace city (fig. 8).[12] Since neither the buttresses nor the walls survive intact at the level of the upper garden, there is no archaeological evidence to prove or disprove his mirador theory. While it is perfectly possible that panoramic vistas could have been enjoyed from any of the buttresses, either through windows pierced in the



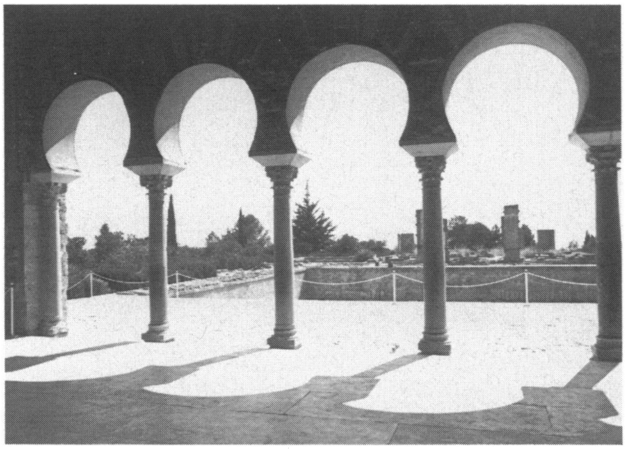
4. Sketch of the Jawsaq al-Khaqani at Samarra. (From Viollet, "Description de palais de al-Moutasim.")



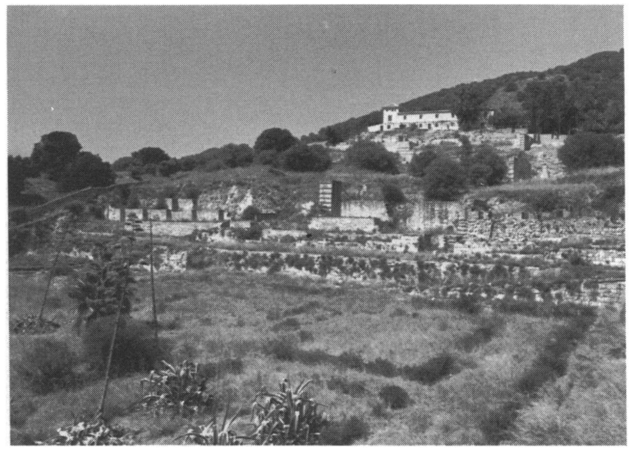
5. Plan of upper garden at Madinat al-Zahraʾ. (After Jiménez Martín, "Los jardines de Madinat al-Zahraʾ.")



6. Salon Rico at Madinat al-Zahraʾ.



7. View from the Salon Rico looking out to the upper garden at Madinat al-Zahraʾ.



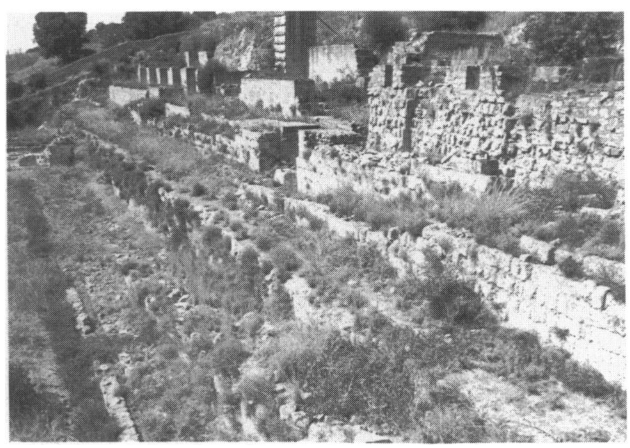
9. Ramp between the upper and lower gardens at Madinat al-Zahraʾ. View from the mirador in the buttress wall of the upper garden, looking northward across the lower garden.

wall at the upper garden level or from the ramparts of the wall and buttresses which might have been reached from the garden by a flight of steps, it is also possible that the buttresses and walls were windowless and inaccessible, enclosing the garden visually as well as physically.

None of these possibilities can be tested. However, a ramp from the upper garden to the lower garden offered a similar view onto the gardens below and across the "natural" landscape of the plains beyond (figs. 9 and 10).[13] The upper portion of the ramp, where it joined the upper garden, was enclosed by walls that are today crumbling away, but the lower portion does not appear to have been enclosed. Although much of the ramp's physical fabric was buried under the collapse of the structures above it to the north, the ramp's zigzag descent is still passable, and it is evident that the gently sloping segments of the ramp would have provided a variety of levels from which the lower garden could be seen (fig. 8).

The ramp arrived at a paved terrace running across the north side of the lower garden, which gave an elevat-

8. Buttress wall and lower garden at Madinat al-Zahraʾ. View from the garden ramp looking south. Hernández Giménez's mirador is in the center of the wall on the left, which separates the upper garden from the lower garden twelve meters below.



10. Ramp between the upper and lower gardens (detail) at Madinat al-Zahraʾ.

ed perspective onto a large rectangular pool and the garden itself, cross-axial in plan like the upper garden. Although the south wall of the lower garden has not been excavated, it is abundantly clear that it could not have been high enough to block the extensive views from either the ramp or the terrace. Like the Jawsaq al-Khaqani's monumental steps and portal, the ramp and terraces provided views of two focal lengths: one looking onto the vegetation, pools, and pavilions of the enclosed garden, and the other looking across the garden to the landscape of the plains beyond.

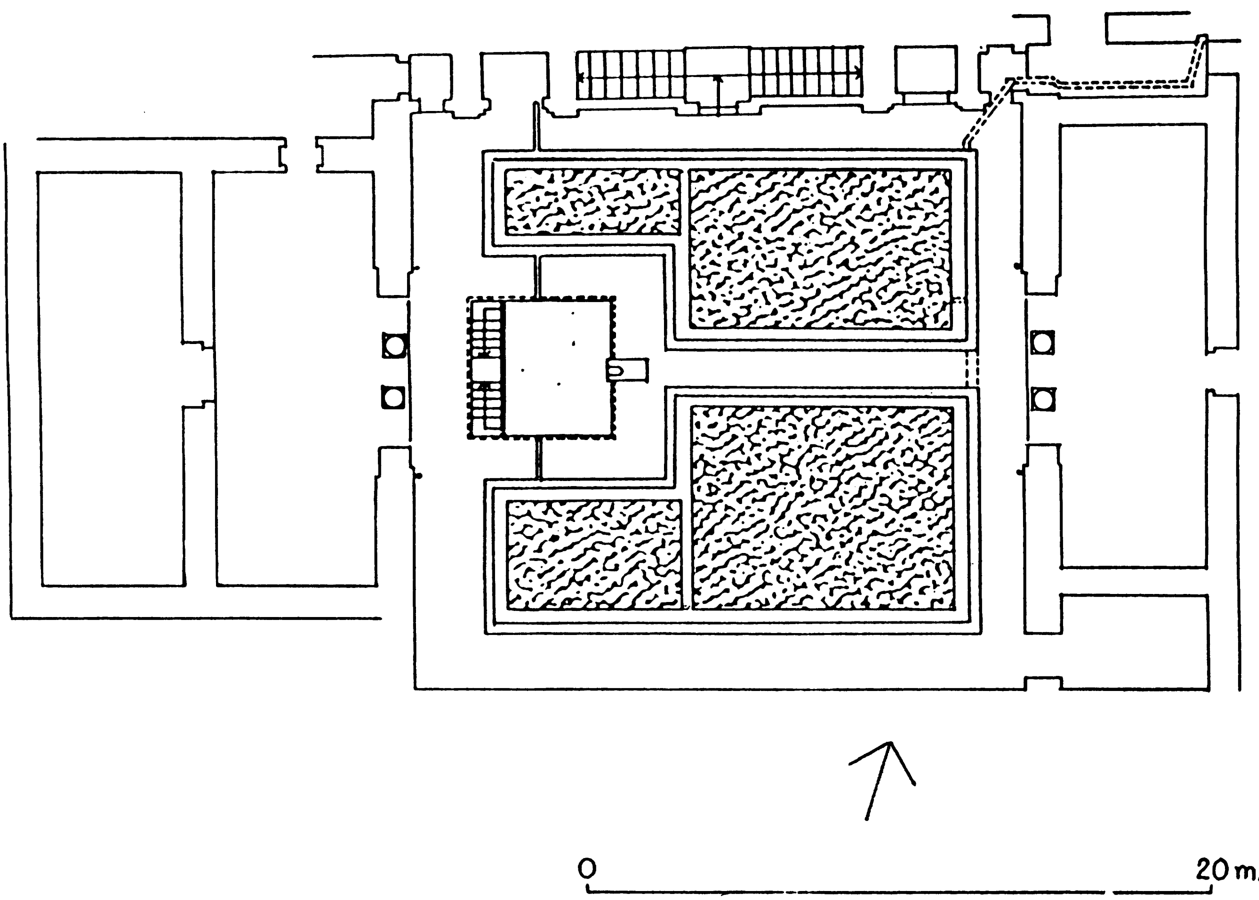
Hernández Giménez's hypothetical mirador suggested itself to him from the Alhambra's many towers and miradors with their views of the hilly landscape of Granada.[14] Whether or not a mirador existed at Madinat al-Zahraʾ in the location he proposed, however, I cannot help but concur with Hernández Giménez's assumption that the palace city was built in stepped terraces on a sloping hillside to take advantage of the panoramic vistas offered by such an elevated site. Furthermore, Arabic texts corroborate the existence of miradors, for al-Nuwayri's description of Madinat al-Zahraʾ's terraces refers to miradors overlooking gardens ("*basātīn taḥt manāẓirihi*").[15] Al-Razi uses *nāfa ʿalā* to describe the same relationship of an elevated hall overlooking gardens, stating that al-Hakam sat "*ʿalā al-sarīr fī miḥrāb al-majlis al-sharqī al-munīf ʿalā al-riyāḍ*."[16] As evidenced by the two Samarran palaces built one hundred years earlier, the notion of architecture oriented to offer landscape views was a fundamental characteristic of Abbasid palace architecture which was borrowed and elaborated upon by the Umayyads of Cordoba.

The magnitude of the vistas sweeping across both garden and landscape at these palaces belies the traditional conception of the Islamic garden as an enclosed, private space. Indeed, the term "Islamic garden" *per se* is meaningless unless, like the categorization of Roman or French gardens, it is qualified by date, place, and even style. At Madinat al-Zahraʾ at least two garden types existed at the same time. The upper garden and the lower garden exemplify the first: large in scale, crossed by two intersecting axes, and traversed by panoramic views passing through and beyond the confines of the garden. The second — the so-called Prince's Garden (fig. 11) — situated to the north of the lower garden and at a considerably higher elevation, is an elegant construction representing an altogether different garden type. This type is characteristically intimate in scale, with one long axis or an abbreviated version of a cross-axial plan, and is visually as well as physically contained by its enclosure walls.

James Dickie convincingly argues for the existence of two gardens types at the Alhambra, one derived from the Roman "villa rustica," the other the Roman "domus urbana." Although his use of Latin terms is questionable, overemphasizing the Mediterranean influence on the Islamic gardens of Spain, in other respects his observations on garden typology are extraordinarily astute. For example, he notes that the two styles are playfully inverted so that the Court of the Lions, which exemplifies the large rustic type, is made intimate and self-contained, while the small urban type, exemplified by the Generalife, is endowed with exterior vistas.[17]

The Prince's Garden at Madinat al-Zahraʾ is rectangular in plan, measures approximately 20 meters long by 19 meters wide, and is contained at its east and west ends by two halls stretching almost the entire width of the garden. A blind wall occupies the south side, and on the north side there is a double flight of steps leading to the top of the thick containing wall which separates the Prince's Garden from the buildings and circulatory road of the level above. A paved walkway bordered by water channels extends from the portal of one hall to the other, forming a longitudinal axis that divides the garden into slightly unequal halves. Like the Salon Rico's garden, an axially aligned square pool occupies the space in front of one of the halls. Although a transverse axis is provided by the thin strip of pavement that crosses the slightly sunken zones of vegetation in front of the pool, in so small a space the organizing power of a true cross-axial plan is unnecessary, and the garden "reads" as a bipartite composition. Any opportunity for a panoramic view from the Prince's Garden toward the lower gardens below was prevented by the height of the south wall. Even standing at the top of the steps on the north side and assuming vision was not curtailed by the kind of curtain wall that enclosed the topmost segment of the upper-lower-garden ramp, it was not possible to see over the south wall.

We can deduce that the Prince's Garden was a private space, since neither al-Maqqari nor Ibn Hayyan, who between them describe the physical construction and courtly life of Madinat al-Zahraʾ in ample detail, refer to any garden or *dār* that matches the appearance of the Prince's Garden. Doubtless it was omitted from their histories because none of their sources or their sources' informants had ever seen it. In contrast, the upper and lower gardens were more public spaces that figured prominently in ceremonies associated with reli-



11. Plan of the Prince's Garden at Madinat al-Zahra᾽. (After A. Jiménez Martin, "Los jardines de Madinat al-Zahra᾽.")

gious holidays, such as the breaking of the Ramadan fast, and the reception of important visitors and foreign embassies.

In the case of the upper garden, the beholder sat on the elevated platform of an axially placed pavilion or hall, raised above a garden too large to be encompassed in one glance. In the case of the Prince's Garden, the beholder viewed the garden from within the garden itself, enjoying nature on immediate terms and delighting in its smallest components: in fact, an overall view of the garden's plan was precluded by its tight, enclosed properties. Thus, the structure of the small garden's composition is subordinated by the enhancement, through physical proximity, of the color and smell of the plants and flowers and the sound of the trickling water. The distinction between the two garden types, that of the Prince's Garden and that of the upper and lower gardens, proves that Madinat al-Zahra᾽'s designers were familiar with at least two well-developed types and that by at least the middle of the tenth century, garden type, like architectural type, was a matter of choice. More than anything else, the direction, distance, and angle of viewing were manipulated in such a way as to be an essential stylistic element imbued with semiotic value that served ʿAbd al-Rahman and the Abbasid caliphs well.

While the Umayyad desert palaces of Syria and Jordan were situated in artificial oases made verdant by qanat irrigation, nothing in their architecture would indicate that nature was enjoyed for its own sake or given aesthetic value. Palaces such as Qasr al-Hayr West and Jabal Says did not exploit topographical variations of their locale, but rather were oriented to the cardinal directions.[18] Nor did they have exterior windows or elevated vantage points from which to survey the cultivated fields and orchards surrounding them.

Similarly in al-Andalus, until ʿAbd al-Rahman's changes, it is likely that the recreation estates in Cordoba's suburbs were relatively simple, symmetrical structures. They were built on the flat countryside bordering the river, predominantly to the west of Cordoba (although a northern suburb with Rusafa as its nucleus and east suburbs were also developed). Since their raison d'être was recreation rather than defense, they may have been made more open to the landscape around them with the use of windows and planted courtyards. One thing is quite certain, however: like the "desert" palaces, the Hispano-Umayyad recreation estates were not located on the kind of sloping terrain that permitted long vistas.

In contrast, the Abbasids were keenly sensitive to the placement of architecture in landscape, emphasizing not just the view of nature but its view from a particular location — the mirador. The mirador, whether a poolside pavilion, three-iwan portal, or a throne room, fixes the direction of gaze and dictates what is seen, and for this reason the locus of a mirador is invariably the intersection of two crossed axes, which emphasize the rigidity of the structure, or one of their terminal points. In addition, just as the prince is raised on his throne or diwan and looks down at his subjects, so too the mirador is elevated, directing the eye's gaze downward so that the garden is seen like a carpet from above. When the mirador is a place associated with a prince, such as a throne room or reception hall, the centrality of the mirador replicates the central importance of the prince. By such means, perception is guided by a sharply focused lens that objectifies the view of garden and landscape and signifies its owner. The mirador, as the origin of seeing, represents the real viewer, the prince, and the view that is proffered is seen through his perspective, emphasizing by its breadth and its limits the extent of his lordship over the visible landscape, his domain.[19] Thus the miradors of palaces such as Madinat al-Zahraʾ, the Jawsaq al-Khaqani, and Balkuwara, which looked outward from axially determined loci toward the exterior landscape, signified the princes who inhabited them, and the views they delivered served to connote princely proprietorship over the land.

The exaltation of the king/viewer, learned from Sasanian models, was introduced into the Islamic context by the Abbasids at Baghdad in the late eighth century and was developed further in their sprawling complex of palaces at Samarra in the ninth. The innovative contrivance of views toward garden and landscape, through the exploitation of topographical elevation and miradors, became part of Islamic palace typology and was transported abroad to the Maghreb where it appears in the stepped plan of the Dar al-Bahr in the Qalʿa of the Bani Hammad, and to Afghanistan where it figured in the elevated situation of the South Palace of the Lashkari Bazar. In al-Andalus, ʿAbd al-Rahman III incorporated such views into the three-tiered plan for Madinat al-Zahraʾ, employing the architectural models of the Abbasids despite his inimical relations with them, to enhance his new stature as prince of al-Andalus, international potentate, and Commander of the Faithful.

Department of the History of Art
University of Pennsylvania
Philadelphia, Pennsylvania

NOTES

1. This paper has been extracted from my doctoral dissertation, "Madinat al-Zahraʾ's Constructed Landscape: A Case Study in Islamic Garden and Architectural History" for the University of Pennsylvania. Research conducted in 1987–89 was assisted by a grant from the Joint Committee on the Near and Middle East of the American Council of Learned Societies and the Social Science Research Council, with funds provided by the Ford Foundation and the Flora Hewlett Foundation.
2. I count more than thirty palaces dating from the tenth century or earlier, among them al-Rusafa, al-Dimashq, Munyat al-Nasr (and the adjoining area known as al-Rakin), Munyat al-Naʿura, Munyat Arhaʾ Nasih, Munyat Ibn al-Qurashiya, Munyat Najda, Munyat al-Rummaniyya, al-ʿAmiriya, Munyat al-Mugira, Munyat ʿAbd-Allah, and a palace built on pilings on the banks of the Guadalquivir River. These are mentioned in al-Razi, *Anales palatinos del califa de Córdoba al-Hakam II,* trans. Emilio García Gómez (Madrid, 1967); Arabic text in Ibn Hayyan, *al-Muqtabis,* ed. A.A. al-Hajji (Beirut, 1965). See also Ibn Bashkuwal in al-Maqqari, *Nafh al-tib*, ed. Dozy et al. (Amsterdam, 1967), and *The History of the Mohammedan Dynasties in Spain,* 2 vols., ed. and trans. Pascual de Gayangos (London, 1840, 1843). L. Torres Balbas, relying on secondary sources and translations, lists twenty-three palaces in *Ciudades Hispanomusulmanas,* 2d ed. (Madrid, 1985), pp. 138–42.
3. Excavations in Madinat al-Zahraʾ have been conducted and published sporadically for eighty years. Published reports include R. Castejón, "El plano de Medina Azahara," *Boletín de la Real Academia de Córdoba,* 11 (1925): 22–25; R. Jiménez Amigo et al., *Excavaciones en Medina az-Zahra (Córdoba): Memorias de la Junta Superior de Excavaciones y Antigüedades,* no. 67 and 7 (Madrid, 1924), and no. 85 and 3 (Madrid, 1926); R. Castejón, "Nuevas excavaciones en Madinat al-Zahra: el salón de Abd al-Rahman III," *al-Andalus* 10 (1945): 147–54; and F. Hernández Giménez, *Madinat al-Zahraʾ: Arquitectura y Decoración* (Granada, 1985), published posthumously with neither plans nor illustrations.
4. E. Herzfeld and F. Sarre, *Erster vorläufiger Bericht über die Ausgraben von Samarra* (Berlin, 1912), excerpted and trans. in K. A. C.

Creswell, *Early Muslim Architecture,* 2 vols. (1940; reprinted New York, 1969), 2: 232–42, 265–70. See also H. Viollet, "Description du palais de al-Moutasim à Samara" and "Fouilles à Samara," *Memoires de l'Academie des Inscriptions et Belles-Lettres,* ser. I, v. 12, pt. 2, (1909 and 1911): 567–94, 685–717.

5. J. Lassner, *The Shaping of ʿAbbasid Rule* (Princeton, 1980), pp. 169–75, 184–203, and "The Caliph's Personal Domain: The City Plan of Baghdad Re-examined," in *The Islamic City: A Colloquium,* ed. Albert Hourani and S. H. Stern (Oxford-Philadelphia, 1970), pp. 103–18.
6. E. Lévi-Provençal, *Histoire de l'Espagne musulmane,* Part III: *Le siècle du Califat de Cordoue* (Paris, 1953), pp. 6–10, 488–96. Also F. Gabrieli, "Omayyades d'Espagne et Abbasides," *Studia Islamica* 31 (1970): 93–100.
7. Lévi-Provençal, *Histoire,* Part II: *Le Califat Umaiyade de Cordoue (912–1031),* 2d ed. (Paris-Leiden, 1950), pp. 116–17.
8. The elevation of buildings for the purpose of giving a perspective onto the grounds below was by no means an Islamic innovation. Persian palaces such as the ʿImarat-i Khusrau at the Qasr-i Shirin and the Hawsh Kuri, both built in the reign of Khusrau II Parviz (591–628), stood on high terraces from which the surrounding gardens could be viewed. (See Ralph Pinder-Wilson, "The Persian Garden: *Baqh* and *Chahar Baqh,*" in *The Islamic Garden,* ed. Elisabeth MacDougall and Richard Ettinghausen [Washington, D.C., 1976], pp. 72–73.)
9. Herzfeld in Creswell, *EMA,* 2: 265–70.
10. Hernández Giménez, *Arquitectura y Decoración,* p. 62; exactly 163 by 144 meters as measured from the exterior of the thick containing walls.
11. Typologically the idea of pavilions illusionistically floating on water and the introduction of water and nature into architectural settings owed a great deal to Imperial Roman villas (See Zoja Pavlovskis, *Man in an Artificial Landscape: The Marvels of Civilization in Imperial Roman Literature* [Leiden, 1973]). For example, at Hadrian's Villa in Tivoli, built in A.D.125–30, the Teatro Marittimo consisted of a circular island retreat surrounded by a moat which was bridged by a single walkway. The effect was primarily architectural, however, with only brief glimpses of nature allowed through portico and wall apertures. In contrast, at Madinat al-Zahraʾ and in later, more fully developed water structures such as the black marble pavilion in the Shalamar Bagh at Kashmir, the pavilion and pool stood amidst greenery, the water acting as a horizontal frame across which the viewer looked for an unimpeded view of the surrounding garden.

    Although in the Islamic context the floating pavilion is an architectural device more commonly associated with Mughal India, Madinat al-Zahraʾ's garden pavilion appears to be an early experiment with the idea on the Iberian Peninsula. Madinat al-Zahraʾ, which became the prototype of royal architectural magnificence in al-Andalus, undoubtedly inspired the close association of water and pavilions in Taʾifa, Almohad, and Nasrid palaces. Most notably, in a palace built by al-Maʾmun (1043–75), the Taʾifa king of Toledo (that is, the ruler of one of the kingdoms that sprang up after the disintegration of the Caliphate of Cordoba), there was a garden with a large pool in the center of which stood a pavilion of glass etched with gold. By an ingenious device, water was made to cascade over the dome of the pavilion while al-Maʾmun sat inside, dry, yet in the very center of a gushing fountain (al-Maqqari, *Nafh al-tib: Analectes sur l'histoire et la littérature des arabes d'Espagne,* ed. R. Dozy et al., 2 vols. [Leiden, 1855–1861; reprinted Amsterdam, 1967] 1: 347–48, 2: 673).
12. Hernández Giménez, *Arquitectura y Decoracón,* pp. 61–62. The mirador theory has been echoed most recently by Alfonso Jiménez Martín, "Los jardines de Madinat al-Zahraʾ," *Cuadernos de Madinat al-Zahraʾ* 1 (1987): 81–92.
13. Since the countryside around Cordoba had been successively cultivated by Romans, Visigoths, and Muslims, it can hardly be termed natural in the sense of being untouched by human hands. Nonetheless, in the tenth century, Madinat al-Zahraʾ marked the westernmost edge of the developed area of Cordoba. Although there were probably several farmed estates on the plain below Madinat al-Zahraʾ (ʿAbd al-Rahman III had given his court officials economic incentives to build houses near Madinat al-Zahraʾ), most of the land between the palace city and the river five kilometers to the south was neither bound by walls nor furrowed by the plow. To the eye, it would have appeared an entirely natural landscape.
14. Hernández Giménez, *Arquitectura y Decoración,* p. 62; the Alhambra's Comares Tower in particular.
15. Al-Nuwayri, *Historia de los musulmanes de España y Africa. Nihāyat al-ʿarab fi funūn al-adab,* ed. and trans. M. Gaspar Remiro (Granada, 1917), p. 62.
16. Ibn Ḥayyān, *al-Muqṭabis,* ed. El-Hajji (Beirut, 1965), p. 21.
17. James Dickie, "The Alhambra: Some Reflections Prompted by a Recent Study by Oleg Grabar," in *Studia Arabica et Islamica* (Beirut, 1981): 127–49.

    Interestingly, the axial water channels of the Lions Court make subtle reference to the typological inversion. The water emanates from the terminal points of the lateral axes, overflowing from basins on raised platforms in fantastically muqarnas-vaulted chambers that replace the pavilion/miradors of an outdoor garden. Just as the muqarnas vaults denote garden pavilions, the channels themselves, in extending beyond the visual parameters of the compressed space of the Lions Court, may allude to the more expansive scale of the large garden type of which it is a variation.
18. For Qasr al-Hayr West, Daniel Schlumberger, "Qasr al-Hayr," *Syria,* 20 (1939): 195–373, and *Les Fouilles de Qasr el-Heir el-Gharbi* (Damascus, 19 Henri Seyrig, "Les Jardins de Kasr el-Heir," *Syria* 12 (1931): 316–18. For Jabal Says, see Klaus Brisch, "Das omayyadische Schloss in Usais," *Mitteilungen des Deutschen Archäologischen Instituts, Kairo* 20 (1965): 163–72. Both sites are discussed in Creswell, *EMA,* vol. 1, part 1, chaps. 15 and 18.
19. For a discussion of the semiotic significance of landscape vista and perspective in an altogether different context, see the chapter on Constable's landscape paintings in Ann Bermingham, *Landscape and Ideology: The English Rustic Tradition 1740–1860* (Los Angeles and Berkeley, 1986).

Spanish gardens in their historical background, by John H. Harvey

Spain is a continent rather than a country - Quien dice España dice todo - and our tour was necessarily limited to one of its realms, Andalusia. We saw Spanish gardening in concentrated form, and in a few days combined visits to some of the finest modern gardens with a serious study of the world's oldest living garden, that of the Generalife at Granada. Among ghosts, we even went to a Moorish garden three centuries older, of A.D. 950, at the palace-city ruin of Medina Azahara.

In ten days we penetrated through the outer growing layers of horticulture to its heart; at leisure we can now turn round and consider chronological development in normal order. The history of aesthetic horticulture as opposed to the production of fruit, vegetables and medicinal herbs begins, in Spain as in England, with the introduction of ancient concepts from the Near East. Whereas with us the impulse came indirectly through the Normans with their simultaneous conquest of Sicily, reinforced by returning Crusaders a generation later, in Spain there had been a direct oriental invasion early in the eighth century. The Peninsula became a province subject to Damascus just after the Muslim tide had appropriated the Garden-Idea of the ancient Near East, as found in Persia and Iraq, and spread it throughout the Mediterranean world. Later political developments gave to Spain a special pre-eminence as the seat of the Western Caliphate (756-1031) of Cordova.

Arab chroniclers record that, while we in England were still in the Dark Ages, Moorish Spain had reached a pitch of luxury in which gardens had a primary position. What was said by Al-Makkari of the pleasure grounds of Murcia by the tenth century: "filled with scented flowers, singing birds and waterwheels with rumorous sound", sets the keynote of this paradisial culture.[1] A century later a list of the plants cultivated at Seville was compiled and shows that there had been a decided advance beyond what was known to the Greeks and Romans.[2] The gardens have disappeared but their tradition lived on to be exemplified at Granada when, from 1248 to 1492, it was the only surviving Moorish Court in Europe. The two old gardens of the Generalife - Jennat al-Arif (Paradise of the Architect) - upper and lower, remain to exemplify the main types which have profoundly affected Spanish gardening. The lower garden (late thirteenth century), and the Court of the Myrtles in the Alhambra (c. 1334-54) are domestic and inward-looking. A walled courtyard or patio, with open arcaded galleries to give shade, has as its central feature a rectangular pool, alberca, surrounded by low plants in beds or by borders of clipped myrtles or other aromatic shrubs. Such gardens are an integral part of the house and, even of minimal scale, survive in many Andalusian houses such as those in the Calleja de Flores (de la Encarnación) descending towards the Mezquita at Cordova.

The second sort of garden is external - what we regard as the only "garden" - with trees and large shrubs and brightly coloured flowers with penetrating perfumes. The upper garden of the Generalife, perhaps formed when the buildings were redecorated in 1319, used the cypress as its principal tree: the last of the original planting lived for over 600 years. There were also orange trees, sweet bay and possibly palms. The ordinary houses of Granada seen by the Venetian traveller Andrea Navagero (1483-1529) were noted for gardens with pools of water, planted with myrtles, roses and musk roses, the mosquetas celebrated through Spanish literature as in Persian. In the Generalife upper

Riviera garden near Marbella. Photograph by Jules Margottin.

garden the cascade as a device for producing "rumorous sound" and coolth was reduced to runlets in the tops of parapet walls climbing the stairs on the hillside. Maximum effect is produced by minimum expenditure of water.[3]

The adoption by Spain of Moorish gardening as the pattern for Christians was due to Pedro el Justiciero, commonly called King Peter the Cruel (1334-1369), the friend of the Black Prince. Preferring Seville to his northern cities, Pedro rebuilt the Alcázar in 1364-66 and had extensive gardens laid out by Moorish designers and gardeners. Successive campaigns of re-planting have in part perpetuated this Moorish garden, though with great additions made for Charles V including a labyrinth and the banqueting-house, the Pabellón de Carlos V of 1543 by Juan Hernández. At the major restoration of 1857 and in more recent work there has been an attempt to preserve the character of these Sevillian layouts of the fourteenth and sixteenth centuries, as well as the later notions such as the <u>burladores</u> or surprise jets of water.[4]

The Moorish garden, adopted at the highest level by the king of Castile, became the pattern for other royal gardens even in the far north of the country. At the great palace-castle of Olite in Navarre, whose architectural ruins survive, there was by the fifteenth century a complete transference of all the features of the oriental paradise from the ancient East. There was a

The Maria Luisa Park, Seville. J.M.

"hanging garden" on a wall supported by arcades and a flat garden laid out with straight walks on a geometrical plan. There were canals and fountains, banqueting-houses and shady galleries, aviaries filled with singing birds and a menagerie of wild animals. The planting included cypress, pine trees, vines, oranges, pomegranates and rare and exotic plants.[5]

In the Renaissance all this became classicised throughout western Europe. Topiary, as in England, became the rage and gardens were filled with sculpture. There were influence from Italy and also from Flanders, the early home of Charles V and source of Spain's economic strength. The greatest private garden in Spain was created for the Duke of Alba (1508-1583) at his country estate of La Abadia (province of Cáceres) before 1577, by a Flemish garden designer. Besides its statuary, some of which survives, the garden was noted for its fantastic topiary, waterworks and grottoes, and its rare plants introduced through Flanders and Germany. Traditional planting with myrtles, lemon and orange trees, and jasmine, formed the framework for this modern art.[6] On a small scale we saw something of this kind, with grotesque carvings and pillars, in the little terraced garden of the Marqués de Salvatierra at Ronda.

Again the lead was taken by the Crown and Philip II, influenced by his sojourn with us as King of England in 1554-58, introduced the English Elm as well as the Oriental Plane in his great planting of Aranjuez begun about 1575.

Duchess of Alba's garden, Seville. Photograph by Peter Hayden.

It was the combination of park, avenues and garden at Aranjuez, "the finest park in the old style in the world" as Loudon called it, that opened the great age of European landscape a century before Versailles.[7] Cervantes in his Persiles of 1615-16 refers to the avenues (calles, "streets") of trees, the rivers, the pools with fish, the flower gardens, the orchards of Aranjuez. Other distinguished writers, Lupercio Leonardo de Argensola (1559-1613) and Baltasar Gracián (1584-1658) were also impressed by the flowers of Aranjuez. In describing the private park of Don Vicencio Juan de Lastanosa at Huesca in northern Aragon, close under the Pyrenees, Gracián showed that it combined the Moorish tradition with some of the new ideas. A pool with swans in it and a "peak" was the centrepiece of a park filled with leafage, perfumes, orange blossom, roses and musk roses, amaranth, lotus and other rare flowering plants.[8]

The avenue, established by Philip II at Aranjuez, was imitated every-

Alcazar, Seville. P.H.

where and was usually planted with poplars (_álamos_, hence the Spanish _alameda_ for an avenue or mall). An early painting by Velázquez (1599-1660) shows the alameda at Seville, and at Toledo the Paseo de Merchán was planted in 1628. Under Philip IV and later monarchs the royal gardens were much extended and those of La Granja (province of Segovia), begun about 1723, eventually came to rival Aranjuez, though they were in a mainly French style for the French king Philip V and intended to surpass Versailles. La Granja is deservedly famous for its fountains and for the great jet thrown well over 100 feet up on the rare occasions when it plays.

Meanwhile Spain's first botanic garden has been founded near Valencia in 1633, one year after Oxford. Moved to its present site in 1802 the Valencia Garden, after a period of neglect in the last century, is again regarded as the finest in Spain. It was imitated elsewhere and Spanish universities, strong in faculties of Medicine, set up Physic Gardens even on inadequate sites such as that in the middle of Granada, with its fine old gingko. Scientific botany had

Marquese de Viana's garden, Cordoba, P.H.

considerable influence on gardening for the Spanish Empire was sending back its riches from early in the sixteenth century. Not only potatoes and tobacco, but floral treasures such as the "African" marigold reached Europe. Seeds which must have passed through Spanish hands got to the Barbary Coast, to be brought back after the conquest of Tunis in 1535 by the victorious troops of Charles V. Also of mainly aesthetic interest were the annual Sunflower, the lesser Nasturtium (Tropaeolum minus), and Marvel of Peru (Mirabilis jalapa), which had arrived before 1600; the Morning Glory (Pharbitis purpurea) soon afterwards; Tropaeolum majus, in Spain by 1684 and here by 1686;[9] and Alstroemeria pelegrina and Zinnia pauciflora, both introductions of 1753.

In the gardens and parks of Spain as we see them now is an immense exotic flora of quite modern introduction. The climate allows the most unlikely combinations of plants from temperate and tropic zones. In the modest patios of town houses and in window-boxes and balconies, geraniums (Pelargonium cultivars) now predominate, though in the Albaicin of Granada we saw specimens

of the traditional white lily and carnation as well. What were the flowers commonly grown in the south of Spain before 1900? Juan Valera (1827-1905) tells us in his masterly essay "La Cordobesa".[10] Apart from trees: cypress, lemon, orange, plane, poplar, the plants included balsam (Impatiens balsamina), sweet basil, box, butcher's broom, carnation, honeysuckle, ivy, jasmine, spurge laurel (Daphne laureola), Marvel of Peru, passionflower, ranunculus, roses as bushes and as climbers, and the spindle (Euonymus). Along with such planting there was occasional use of rarer trees such as the Magnolia grandiflora, planted with cypresses in 1795, which we saw at the Palacio de Viznar near Granada.

On the Costa del Sol there have long been introductions from England by way of Gibraltar (as if to compensate for our getting Rhododendron ponticum that way), where the Alameda formed in 1814 by Sir George Don (1754-1832) when Governor has always been botanically noteworthy, still more after improvement under Lord Napier of Magdala, Governor in 1876-83. There may also have been influence from the early British colony in Malaga, though the city had always been a botanical centre. The most important encyclopaedic work on medical botany of the Middle Ages, the General Treatise of Remedies and Simples describing 1,400 drugs, was compiled in Arabic by Ibn al-Baitar of Malaga who died in 1248.[11] This tradition survived the reconquest and found expression in the magnificent gardens, in Moorish style, of the former royal palace of Buen Retiro (about six miles west of Malaga), with waterworks and fountains and straight walks of cypress.

The Irishman William Bowles (1705-1780), superintendent of Spanish Mines and author of a natural history of Spain (1775) wrote very truly that "the land of this coast is excellent and its southern climate invites the introduction of plants from America and other hot countries, which would be a boon and delight to Europe". Bowles' suggestion was taken up by Canon Cristôbal Medina Conde and the Royal Botanic Garden had been founded in the Calle de la Victoria before 1789. Medina Conde describes the "Peregrinas of Peru, or Alstroemeria (A. pelegrina) with flowers of various colours, crimson, scarlet, spotted and yellow" growing there splendidly among many other exotic and native plants. A series of disasters interrupted this horticultural advance. Besides the French invasion, appalling epidemics of yellow fever struck Malaga five times in 1801-1821.[12] Charles Waterton (1782-1865), the English naturalist, survived the pestilence of 1803, recording that 50,000 people fled the city and of those who stayed 14,000 died including the uncle with whom he was staying. Waterton describes the horrors of the disease, and of the earthquake which followed.[13] The arts of leisure, including botanical gardening, ceased; but later on burst out with renewed vigour; the magnificent Alameda and the Park running through Malaga are unequalled in the Mediterranean. Thanks to the generous hospitality of Spanish gardeners our party, even in a brief visit, could appreciate the horticultural splendours of the region.

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Notes

[1] V. Lampérez y Romea, Arquitectura Civil Espãnola (1922), I, 412.

2 J.C. Loudon, Encyclopaedia of Gardening (3rd ed., 1828), 63-64.

3 Lampérez, op. cit., I, 411-419, gives a good general account with quotations from early writers.

4 Various guide-books, including Murray's Handbook for Spain (1898), Baedeker (1913), Muirhead's Blue Guide to Southern Spain (1964); J. Guerrero Lovillo, Sevilla (Guías Artísticas de España, 1952), S. Montoto, La Cathedral y el Alcázar de Sevilla (Los Monumentos Cardenales de España, III).

5 Lampérez, op. cit., I, 411.

6 Ibid., I, 417-418.

7 Loudon, op. cit., 65.

8 Spanish literary references to gardens are mostly from Azorín, El Paisaje de España visto por los Españoles (1917), which also contains his essay "Jardines de España".

9 A.M. Coats, Flowers and their Histories (3rd ed., 1968); The Quest for Plants (1969).

10 J. Valera, Obras Completas, vol. 45; extracts are printed by Azorín (see note 8 above).

11 M. Nakosteen, History of Islamic Origins of Western Education (Boulder, Colorado, 1964), pp. 171, 182, 250.

12 I am much obliged to the Baronesa de Schlippenbach for telling me of the book of Cristóbal Medina Conde (Cecilio García de la Leña), Conversaciones históricas malagueñas (Malaga, 4 vols., 1789-92), which in vol. I (145-159) gives a list of plants native to the district and an account of those introduced from America and the West Indies. I have also to thank Don Modesto Laza Palacios for kindly sending me a copy of his historical account of the park at Malaga, "Nuestro Parque", from Jábega (revista de Málaga), no. 2, 1974.

13 C. Waterton's autobiography quoted in introduction to his Wanderings in South America, ed. N. Moore (1891), pp. 18-22.

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Gardening books and plant lists of Moorish Spain, by John H. Harvey

The introduction of plants from one country to another has gone on for several thousand years, and the main movements have been towards the highest centres of civilisation.[1] Thus the expedition of the Chinese general Chang K'ien under Emperor Wu-ti (141-87 B.C.) succeeded in transporting lucerne (as fodder for blood-horses) and the grapevine from Persia in 126 B.C.[2] Pliny tells us of the cherry brought from Pontus to Rome in 68 B.C. Plants of economic importance, medicinal herbs, and flowers sought only for beauty, perfume or rarity, were carried in all directions long before the age of modern science.

Western Europe owes many plants as well as much horticultural technique to the dominion of the Moors in Spain from A.D. 711 to 1492. Under the Western Omayyad Caliphate of Cordova (929-1031) Andalusia was the highest centre of civilisation in the Euro-mediterranean region and produced scientific literature in all fields, linked with the immense Islamic culture in Arabic. Botany, Agriculture and Horticulture, with the Pharmacopoeia, formed branches of a subject eagerly pursued by scholars and by practical collectors and cultivators. Though the debt of Europe, and of modern civilisation, to Arabic science is well known, the importance of the Islamic contribution to horticulture has not been sufficiently recognised.

In Spain, even today, cultivation is at its best in the parts of the country longest under Moorish rule, or which took pains to preserve Moorish methods. Much knowledge was conveyed personally from the Muslims and their baptised descendants the Moriscos to the Christian Spaniards. Long before the expulsions (1492-1609) the Christians were learning from Arabic agricultural literature through translations into Latin and Castilian. Besides, many Christian Spaniards in Aragon, Andalusia, and Toledo were still bilingual. Continuity was preserved both on the scholarly and practical planes. Plants, once introduced, were likely to survive and were carried further into Europe by seeds, bulbs, cuttings or roots, to whatever places were climatically able to grow them. Many of the most important additions to European gardens made since Roman times arrived by way of Moorish Spain.

The peak of introduction came late, after centuries of increasing sophistication. By the ninth century A.D. the cultural centre of Islam was in Persia, Iraq and northern Syria, and the plants in question were mostly native to Iran or long cultivated there. About our King Alfred's time, but nearly three thousand miles away, a new age of science dawned with the establishment (c. 830) of a research institute at Baghdad, largely for the translation into Arabic of works in Greek, Pahlavi, and Indian languages. The chief translators were Hunain ibn Ishaq al-'Abadi (809-877) and his son Ishaq ibn Hunain (d. 910), and among the works translated was the whole of the Materia Medica of Dioscorides.[3] A new Book of Plants was written in Arabic by the Persian al-Dinawari (c. 820-895), "the Father of Arab Botany".[4]

Just when this new knowledge became available it was brought to Spain by Yunus ibn Ahmad al-Harrani, about 880. Al-Harrani, so called from his birthplace Harran (in modern Turkey, between Urfa and the Syrian frontier), an ancient seat of learning, took with him to Cordova drugs and plants as well as advanced botanical information.[5] About this time an extensive compilation on agriculture, quoted by later authorities, was produced by al-Kaldani,[6] born before 912, but of whom nothing is known beyond his great

reputation. During the tenth century Cordova became the main centre of botanical studies on account of an illustrated manuscript of Dioscorides sent in 949 by the Byzantine Emperor Constantine VII Porphyrogenitus (913-959) to the Caliph 'Abdarrahman III (912-961). This book with its coloured pictures of plants excited so much interest that the Caliph obtained from the Emperor in 951 the Arabic-speaking monk Nicholas, able to translate the book and also to teach Greek in public lectures in Cordova, attended even by the prime minister. This was not the end of the story, for under Hisham II (976-1009) an important supplement to Dioscorides on the plants of Spain was written in 983 by the Caliph's physician, Ibn Juljul.[7]

The Golden Age of Cordova was coming to an end, and the Christian reconquest setting in, but the best Andalusian horticulture and its greatest books were still to come. After the end of the Western Caliphate in 1031 Muslim Spain broke up into succession states, the Taifas, the most important being Seville and Toledo. The sultans of both states maintained important palace gardens and the site of that at Toledo, near the railway station, is still known as the Huerta del Rey. What is more, both became[8] genuine botanical gardens, that at Toledo created by Ibn Wafid (999-1075), and carried on after his death by his colleague Ibn Bassal,[9] himself a great botanist, plant collector, and writer on agriculture. Until the Christian conquest of 1085 he was in charge under al-Ma'mun, sultan of Toledo. Later he worked for Sultan al-Mu'tamid (1069-1091) at Seville, where he sowed imported seeds. He had botanised in Sicily, Alexandria, Cairo, Mecca, Khorasan (in northern Persia), and in eastern Spain around Valencia. He told another botanist whom he met in Andalusia that he had seen "the Blue Lily" (susan, an iris) both in Sicily and at Alexandria.

The great importance of Ibn Bassal lies in the survival of the masterly handbook on agriculture and gardening, both scientific and practical, which he dedicated to his royal master al-Ma'mun.[10] The Arabic text has been rediscovered in our own time, as well as an incomplete Castilian translation made c. 1300. The book is thoroughly modern in tone and starts with a discussion of water supply, soils, manures and the choice of ground and its preparation. Particular chapters then give, species by species, methods of planting, pruning and grafting trees, sowing of seeds, and the different classes of vegetables, herbs and aromatic flowering plants and bulbs. In conclusion there is a selection of miscellaneous tips, such as that on the ever-present problem of slugs: "Form your beds, strew on them an inch of ashes from the Public Baths, then lay on your manure and sow the seed; thus the animal mentioned, on leaving the earth in search of the plants, will meet with the ashes and retire confounded."

To us it is the chapters enumerating all the kinds of trees and plants grown, with the appropriate culture of each, that provide the special interest of the book. Their value is increased by the fact that another detailed treatise on Andalusian agriculture survives from the next century, showing a great advance in the number of species in cultivation. This is the Book of Agriculture of Ibn al-'Awwam,[11] printed in time to be used by J.C. Loudon; unfortunately he garbled the author's name as "Ebn-Alwan" and assigned him to the eleventh century, though he wrote late in the twelfth and died about 1200. Ibn al-'Awwam's treatise is on a larger scale than that of Ibn Bassal and is more expressly concerned with transplanting trees and wild plants into

gardens. He adds sections on cattle, horses, poultry and bee-keeping. The lists of plants grown by these two writers are compared in the appendix to the present article.

Before passing on to the cultivated Spanish flora revealed by these authorities, it is worth mentioning a few other writers, though most of their works are lost. In the eleventh century, besides Ibn Wafid and Ibn Bassal, both of Toledo, there was Ibn Hajjaj of Seville, whose compendium on simples, The Sufficiency, was written in 1073-74.[12] The geographer Ibn Amr (died 1094) produced a book on the plants and trees of Andalusia.[13] A little later came al-Tignari,[14] who dedicated a treatise to the prince of Granada, Abu Tahir Tamim (d. 1125). Great medical botanists too were at work: Ibn Zuhr (Avenzoar) who died in 1161; Ibn Bajja (Avempace) of Toledo (d. 1138); and al-Ghafiqi (d. 1166), author of one of the greatest of all mediaeval herbals.[15] To this or a slightly later generation belonged Ibn al-'Awwam. Later still the tradition was carried on by the work of the traveller Ibn Mufarraj (c. 1170-1240) on Dioscorides,[16] and the lost books of Abu al-'Abbas Ahmad al-Nabati ("the Botanist"), born of a Christian mother at Seville about 1170, and known to have studied plants in Spain and throughout North Africa as far as the Red Sea.[17] All this led up to the immense encyclopaedia of Ibn al-Baitar on the medical virtues of plants.[18] Finally, gardening was included in the poem on agriculture ("the Andalusian Georgics") of Ibn Luyun, born at Almeria, who died in 1349.[19]

The two books listing the cultivated plants of Andalusia c. 1080 and c. 1180 show that in one century the number of species had doubled. Though partly due to Ibn al-'Awwam's more thorough treatment, the increase does suggest that there was a real wave of introductions to Spain, or to cultivation, soon after 1100. Many new plants were decorative rather than useful: the Judas Tree, many varieties of Myrtle, the Oleander, Hibiscus, Mallows, and Water-Lilies. Some plants already had numerous cultivated varieties, notably _al-khairi_, the wallflower (_Cheiranthus cheiri_), though also including the stock (_Matthiola incana_). In both books this is said to have eight kinds: the common purple, white, yellow, white and scarlet mingled, a "turquoise", a very brilliant brown, a tawny, and a "sky-blue"; also a small purple wild sort (possibly _Moricandia moricandioides_*) and the "Water Wallflower", purple and flowering in summer. This last sounds like Sweet Rocket (_Hesperis matronalis_), but it is hard to say what the turquoise and sky-blue flowers could have been.

There is a similar difficulty over the kinds of lily: white, brown, yellow and sky-blue. The white was certainly _Lilium candidum_; the brown and yellow may have been _Hemerocallis fulva_ and _H. flava_, since these were assigned medicinal uses by al-Ghafiqi under their true name in Arabic guise: _Imaruqalis_.[20] The blue lily was almost certainly an iris since the Arabic _susan_, Spanish _azucena_, had that primary meaning. On the other hand, "the small blue lily" is separately described as an iris. The white narcissus "with a small yellow circle in the middle" is clearly described, and al-'Awwam gives the standard cultural hint: "Some persons dedicated to the knowledge of floriculture say that when the leaves of this bulb have dried, as

* Mr Richard Gorer's suggestion.

happens during the summer, it should then be taken up and stored until the time comes for planting, viz. in September".[21] The violet comprised only two kinds, the wild and the cultivated, grown at Seville and Cordova. "Seed should be sown on sheltered shady beds, and also in new flower-pots, perforated (for drainage), after putting on the surface of the bed or pot some crumbled brick-dust from an old wall or similar material, mixed with an equal amount of pigeon's dung".[22]

The deliberate naturalisation of wild plants forms one of the most significant features of gardening as practised by al-'Awwam. He tells us: "Bell-ivy (Bell-bind, perhaps _Calystegia sepium_ or _Convolvulus_ spp.) is a wild plant called Poor Man's Cord, with a beautiful flower. It is like a small kind of ivy. The ivy called _kissus_ (_Hedera_ spp.) is a wild plant which climbs trees and hangs down from them. Both these may be moved to gardens, taking them up with their roots in February, and planted near the water-channels they are watered from time to time until they become established. For these climbers one makes a trellis of stakes on which both kinds climb and are sustained".[23]

Although most of the plants in both books can be identified, at least as to genus, there are several difficulties. Generally these are due to confusion of nomenclature, coming from Greek, Persian and Arabic sources, of exactly the same kind that beset all pre-Linnean botany.[24] Sometimes the problem merely concerns the particular species of a known group such as the mallows: there were shrubby forms (probably _Hibiscus syriacus_), marshmallow and or hollyhock, and several varieties of mallow. There is doubt as to whether the "glaucous poppy" was a _Glaucium_, a _Hypecoum_, or even _Chelidonium majus_. "Lavender" is not specific. A plant described as a yellow ox-eye might theoretically be a _Buphthalmum_ but was perhaps more probably _Asteriscus maritimus_. The sorts of jasmine included a purple one, which may have been some unrelated plant of similar habit, perhaps _Periploca graeca_. There was a "Macedonian bulb", thought by Clément-Mullet to be the _Iris macedonica_ of Pliny (probably _I. variegata_).[25] Problems of the "Lily" have already been discussed. Among the vegetables there is the kidney-bean, linquistically indistinguishable from modern products of the genus _Phaseolus_, though all our garden kidney-beans are now believed to come from America. Ibn al-'Awwam refers to 12 varieties, showing that the plant had long been in cultivation before the twelfth century: probably it was _Dolichos lablab_.[26]

The varieties of the rose are said by al-'Awwam to include a blue rose and roses yellow without and blue within, and blue without and yellow within, the last particularly common at Tripoli in Syria. There may have been two different sources of confusion: the use of "rose" (as with Christmas Rose) to describe unrelated plants such as hibiscus; and a mistake of "blue" for red, in which case the roses of mixed colour could be forms of _Rosa foetida bicolor_. The Chinese rose (_ward al-sini_) may have been _Hibiscus rosa-sinensis_, but it is conceivable that _Rosa chinensis_ or one of its hybrids had already reached the West, to give rise to some of the remontant roses available before the eighteenth century.[27]

Besides the many cultivated roses there was the wild dog-rose, commonly called _nisrin_ in Arabic.[28] The "nisrin", however, is described as a bulbous plant in two sorts, white and yellow, with a very sweet scent and a hanging flower. The bulb is small and grows in meadows; the flowers come out in

October and are the first flowers of the season to spring from the earth.[29] This, of course, implies the logical season of the "farmer's year" starting from the autumnal equinox. From the description Mr Richard Gorer suggests that these were colour forms of Narcissus tazetta or related species. From literary, as distinct from horticultural and botanical sources, Mr James Dickie has drawn up a parallel list of some 50 plants grown in Andalusian pleasure gardens of the eleventh and twelfth centuries.[30]

Did we benefit from this modern gardening in the Spain of eight or nine centuries ago? Yes, but indirectly. From 1085 Toledo, from 1236 Cordova, from 1248 Seville belonged to Castile. Valencia and its rich huerta were taken for the realm of Aragon in 1238. Granada, though Muslim until 1492, was tributary to Castile and often an ally of the Christian Castilians. We know that Englishmen stayed in Spain and brought back Arabic science - notably Adelard of Bath c. 1120, when he collaborated with the converted Jew Petrus Alphonsi from Aragon, later physician to Henry I. Daniel de Morley, who studied at Toledo under Gerard of Cremona (1114-1187), returned to England "with a precious multitude of books" about 1185.[31] England and Spain remained politically very close until after 1500. Another main route for scholarly information was by way of Montpellier in southern France, where a medical school was founded by Arab and Jewish physicians from Spain in the twelfth century and incorporated in 1221; the University was founded in 1289. From 1204 to 1349 the lordship of Montpellier belonged to the Crown of Aragon and it was thus an outpost of Spanish influence.[32] It is of interest that the Botanic Garden, founded in 1593, is the oldest in France and earlier than any of the post-mediaeval gardens in England or Spain.[33]

The plants whose cultivation is detailed in the books of Ibn Bassal and Ibn al-'Awwam have been rearranged in main categories and put into alphabetical order (see below). In a few instances plants have been repeated in parenthesis when they belong notably to more than one class; but it can be assumed that medicinal uses were assigned to practically all plants in every category. In addition to the plants listed, Ibn al-'Awwam described the cultivation of the cereals Barley, Millet, Italian Millet, Rice, Wheat, Summer Wheat (Triticum dicoccum), and Zeocrithon.[34]

* * * * * *

Appendix: Plants cultivated in Southern Spain, c. A.D. 1050-1200

Scientific names are in most cases according to the Royal Horticultural Society's Dictionary of Gardening, 1956/1965.

Ibn Bassal, c. 1080	Ibn al-'Awwam, c. 1180
FRUITS AND NUTS	
*Almond	*Almond
*Apple	*Apple
Apricot	Apricot
	Azarole (Crataegus azarolus)
	*Banana (Musa sp.)
	Bramble
	*Carob (Ceratonia siliqua)

Ibn Bassal, c. 1080	Ibn al-'Awwam, c. 1180
FRUITS AND NUTS continued	
*Cherry	*Cherry, Black and Red
Chestnut (*Castanea sativa*)	Chestnut
Citron	Citron
*Date Palm (*Phoenix dactylifera*)	*Date Palm
*Fig	*Fig
*Grapevine	*Grapevine
Hazel and Filbert	Hazel and Filbert
	Jujube(*Zizyphus jujuba*)
	*Lemon
	Lotus (*Celtis australis*)
	*Medlar (*Mespilus germanica*)
Melon	Melon
*Mulberry, White (*Morus alba*)	*Mulberry, White
Olive	Olive
*Orange	*Orange
Peach, Clingstone, Freestone	Peach
*Pear	*Pear
Pistachio (*Pistacia vera*)	Pistachio
*Plum	*Plum
*Pomegranate (*Punica granatum*)	*Pomegranate, and wild sort*
*Quince	*Quince
	(Sebesten) (*Cordia myxa*)
Service (*Sorbus domestica*)	Service
	Shaddock (Grape Fruit)
Walnut (*Juglans regia*)	Walnut
Water Melon	Water Melon, two sorts
FOREST AND ORNAMENTAL TREES AND SHRUBS	
	Acacia (*Acacia arabica*)
?Althaea, shrubby	Althaea (*Hibiscus syriacus*)
Arbutus (*Arbutus unedo*)	Arbutus
Ash (*Fraxinus* sp.)	Ash
	(Azarole)
Azedarach (*Melia azedarach*)	Azedarach
*Bay (*Laurus nobilis*)	*Bay
	Buckthorn (*Rhamnus cathartica*)
	Butcher's Broom (*Ruscus* sp.)
(Chestnut)	(Chestnut)
*Cypress (*Cupressus sempervirens*)	*Cypress
"Elm, Black") (? Poplars *	
" " White") *Populus* spp.*)	
	Hawthorn (*Crataegus* spp.)
	Ivy (*Hedera helix*)
	*Jasmine (*Jasminum officinale*)
	* " Yellow (*J. fruticans*) *
	" Purple (? *Periploca graeca**)

Ibn Bassal, c. 1080	Ibn al-'Awwam, c. 1180
FOREST AND ORNAMENTAL TREES AND SHRUBS continued	
	Judas Tree (Cercis siliquastrum)
	*Lavender (Lavandula spp.)
	*Myrtle (Myrtus communis)
Holm Oak (Quercus ilex)	Holm Oak
	*Oleander (Nerium oleander)
	"Palm, small, called 'Kadi'" (? Pandanus tectorius)
Pine (Pinus pinea?)	Pine
	Plane (Platanus orientalis)
	Reed (Arundo donax?)
Rose (Rosa spp.)	Rose
Rue (Ruta graveolens)	Rue and Wild Rue
	Sebesten (Cordia myxa)
(Service)	(Service)
(Walnut)	(Walnut)
	*Willow (Salix spp.)
FLOWERS AND HERBS	
Anise (Pimpinella anisum)	Anise
	Anise, Wild (Daucus gingidium)
Balm (Melissa officinalis)	Balm
*Basil (Ocimum basilicum)	*Basil
*Bindwind (? Calystegia sepium)	*Bindweed
	(Butcher's Broom)
*Camomile (Anthemis nobilis)	*Camomile
Caraway (Carum carvi)	Caraway
? Celandine, Greater (Chelidonium majus)	? Celandine, Greater
*Colocasia (Colocasia antiquorum)	*Colocasia
*Colocynth (Citrullus colocynthis)	*Colocynth
Coriander (Coriandrum sativum)	Coriander
Cumin (Cuminum cyminum)	Cumin
	Dill (Peucedanum graveolens)
	Dragons (Dracunculus vulgaris)
	Elecampane (Inula helenium)
	Fennel (Foeniculum vulgare)
	Fumitory (Fumaria officinalis)
	? Hellebore, Black
	Henbane (Hyoscyamus niger)
	Hibiscus (H. rosa-sinensis)
	Hollyhock (Althaea rosea?)
	*Iris (Iris spp.)
	('Macedonian bulb'? I. variegata**)
	(Lavender)
Leadwort (Plumbago europaea)	
*Lily (Lilium candidum)	*Lily
	Mallow, Cordova)
	" Garden)- (Malva spp.)
	" Sicilian)

FLOWER AND HERBS continued

Ibn Bassal, c. 1080	Ibn al-'Awwam, c. 1180
*Mandrake (*Mandragora officinarum*)	
*Marjoram (*Origanum majorana*)	*Marjoram
	" Wild (*Origanum vulgare*)
Marshmallow (*Althaea officinalis*)	Marshmallow
	Marum (*Teucrium maru*?)
Melilot (*Melilotus officinalis*)	Melilot
	*Mint (*Mentha* spp.)
*Narcissus, White	*Narcissus, White and Yellow*
* " Yellow	
	"Nisrin" (*Narcissus tazetta*?**)
Nigella (*N. sativa*)	Nigella
	Ox-eye, White (*Anacyclus valentinus*?)
Ox-eye, Yellow (*Asteriscus maritimus***?)	Ox-eye, Yellow
	(Parsley - see VEGETABLES, Celery)
	Plantain (*Plantago* spp.)
	*Poppy, White (*Papaver somniferum*)
	Rocket (*Eruca sativa*)
*(Rose)	*(Rose)
(Rue)	(Rue)
*(Saffron)	*(Saffron)
	Savory (*Satureia* sp.)
	"Squill, Lesser" (*Pancratium maritimum*?)
*Violet (*Viola odorata*)	*Violet
*(Wallflower (*Cheiranthus cheiri*)	*Wallflower
*(and Stock (*Matthiola incana*)	*Stock
	*Water Lily, White (*Nymphaea alba*)
	" " Red (--var. *rubra*)
	" " Yellow (*Nuphar lutea*)
Wormwood (*Artemisia absinthium*)	Wormwood

VEGETABLES AND SALADS

Ibn Bassal, c. 1080	Ibn al-'Awwam, c. 1180
	Artichoke (*Cynara scolymus*)
Asparagus	Asparagus
	*Bean, Broad (*Vicia faba*)
	" Kidney (*Dolichos lablab*?)
Blite (*Chenopodium capitatum*)	Blite
Cabbage and Roman Cabbage	Cabbage
Carrot	Carrot
Cauliflower	Cauliflower
	Celery (? also Parsley)
	Chick Pea (*Cicer arietinum*)
	Chickling Pea (*Lathyrus sativus*)
	Cress
Cucumber	Cucumber

Ibn Bassal, c. 1080	Ibn al-'Awwam, c. 1180
VEGETABLES AND SALADS continued	
Egg-plant (*Solanum melongena*)	Egg-plant
(? Chicory or Endive)	Endive
	Fenugreek (*Trigonella foenum-graecum*)
Garlic	Garlic
	Gherkin
Gourd	Gourd
Leek	Leek
	Lentil (*Lens esculenta*)
Lettuce	Lettuce
	*Lupin (*Lupinus albus*)
Onion	Onion
	Orach (*Atriplex hortensis*)
	"Parsnip" (*Pastinaca dissecta*)
	Pea
Purslane (*Portulaca oleracea*)	Purslane
Radish	Radish
	Sorrel (*Rumex acetosa*)
Spinach (*Spinacia oleracea*)	Spinach
Spinach Beet (*Beta vulgaris cicla*)	Spinach Beet
Turnip	Turnip
ECONOMIC PLANTS	
Caper (*Capparis spinosa*)	Caper
	Chufa (*Cyperus esculentus*)
	Clover (*Trifolium alexandrinum*)
	Cotton (*Gossypium arboreum*)
	*Flax (*Linum usitatissimum*)
	Hemp (*Cannabis indica*)
	Henna (*Lawsonia inermis*)
	Indigo (*Indigofera tinctoria*)
	Lucerne (*Medicago sativa*)
Madder (*Rubia tinctorum*)	Madder
	Mustard (*Sinapis alba*)
Nigella (*N. sativa*)	Nigella
Pepper (*Piper nigrum*)	
	Safflower (*Carthamus tinctorius*)
Saffron (*Crocus sativus*)	Saffron
Sesame (*Sesamum indicum*)	Sesame
	Sugar Cane (*Saccharum officinarum*)
	Sumach (*Rhus coriaria*)
	Tares (*Vicia* spp.)
	Teasel (*Dipsacus fullonum*)
	Woad (*Isatis tinctoria*)

* See note 30.

** The proposed identifications marked thus have been made by Mr Richard Gorer, who kindly allows me to include them.

* * * * * *

Acknowledgments

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Notes

1 A.M. Coats, *The Quest for Plants* (1969); K. Lemmon, *The Golden Age of Plant Hunters* (1968), pp. 2-4.

2 B. Laufer, *Sino-Iranica* (Chicago, Field Museum Anthropological Series, XV No. 3, 1919), 210, 221. Laufer shows that several other plants allegedly introduced to China by Chang K'ien did not arrive until much later.

3 De Lacy O'Leary, *How Greek Science passed to the Arabs* (1949), pp. 164-169; M. Nakosteen, *History of Islamic Origins of Western Education* (Boulder, Colorado 1964).

4 Abu Hanifa Ahmad ibn Da'ud al-Dinawari. A modern edition was begun by B. Lewin (Uppsala, Wiesbaden 1953); continued in *Bibliotheca Islamica*, 26 (1974).

5 M. Meyerhof, "Esquisse d'histoire de la pharmacologie et botanique chez les musulmans d'Espagne", *Al-Andalus*, III (1935), 1-41; O'Leary, *op. cit.*, pp. 172-175.

6 Abu Bakr Ahmad ibn Ali ibn al-Wahshiyya al-Kaldani (Nakosteen, p. 274).

7 Abu Da'ud Sulaiman ibn Hassan ibn Juljul (O'Leary, *op. cit.*, p. 171; Nakosteen, p. 252).

8 Abu-l-Mutarrif 'Abd al-Rahman ibn Muhammad ibn 'Abd al-Kabir ibn Yahya ibn Wafid al-Lakhmi (Abenguefidh). He wrote a treatise on agriculture of which a fourteenth-century Castilian translation survives (J.M. Millâs Vallicrosa, *Al-Andalus*, VIII, 1943, 281-332); cf. L. Faraudo de Saint-Germain, *El Libre de les Medecines Particulars* (Barcelona 1943), p. viii.

9 Abu 'Abd Allah Muhammad ibn Ibrahim ibn Bassal al-Tulaytuli (of Toledo).

10 Ibn Bassal, *Libro de Agricultura*, edited with Spanish translation by J.M. Millas Vallicrosa and M. Aziman (Tetuan, Instituto Muley el-Hasan 1955); cf. Millâs Vallicrosa, *Al-Andalus*, XIII, 1948, pp. 347-430.

11 Abu Zakariya Yahya ibn Muhammad ibn Ahmad ibn al-'Awwam al-Ishbili (of Seville). The manuscript survived in the Royal Library at the Escorial and extracts were translated in 1751 by command of Ferdinand VI (1746-1759). The whole book was published in parallel Arabic text and Spanish translation by J.A. Banqueri, a canon of Tortosa (2 vols. Madrid 1802). A French translation, with improved identifications, was made by J.J. Clément-Mullet, *Le Livre de l'Agriculture* d'Ibn al-Awam (2 vols., Paris 1864-67).

12 Abu-l-Khair Ahmad ibn Muhammad ibn Hajjaj al-Ishbili (E. García Gómez, *Al-Andalus*, X, 1945, p. 137). Millás Vallicrosa called him Abu-l-Khair al-Shajjar al-Ishbili (*Al-Andalus*, XX, 1955, p. 101), distinguishing him from Abu 'Umar ibn Hajjaj (Nakosteen, p. 274).

13 Abu 'Ubaid 'Abd Allah ibn 'Abd al-'Aziz ibn Muhammad ibn Aiyyub ibn Amr (Nakosteen, p. 235).

14 Abu 'Abd Allah Muhammad ibn Malik al-Tignari, born in the neighbourhood of Albolote, close to Granada (E. García Gómez, *Al-Andalus,* X, 1945, p. 137; J.M. Millás Vallicrosa, *ibid*., XIX, 1954, pp. 129-142).

15 M. Asín Palacios, *Al-Andalus*, V, 1940, 255-299. There seems to be some confusion between Zuhr (d. 1131) and Ibn Zuhr (d. 1161); cf. Nakosteen, pp. 255-256. Part of an abridgement of *The Book of Simple Drugs* of Abu Ja'far Ahmad ibn Muhammad al-Ghafiqi was edited and translated by M. Meyerhof and G.P. Sobhy (Cairo, Egyptian University, Faculty of Medicine, Publication No. 4, 4 fasc., 1932-40).

16 Abu al-'Abbas Ahmad ibn Muhammad ibn Mufarraj (Nakosteen, p. 257).

17 Nakosteen, p. 171, and information kindly sent by Dr Derek Latham.

18 Abu Muhammad 'Abd Allah ibn Ahmad ibn al-Baitar Dhiya al-Din al-Malaqi, born at Malaga and died 1248 at Damascus. His great work was translated into German by Joseph von Sontheimer (2 vols., Stuttgart 1840-42), and into French by Lucien Leclerc (*Notices et Extraits des manuscrits de la Bibliothèque Nationale*, XXIII, XXV, XXVI, Paris, 1877-83).

19 Abu 'Uthman ibn Luyun al-Tujibi; see E. García Gómez, *Al-Andalus*, X, 1945; Nakosteen, p. 258. Ibn Luyun's general precepts for garden design and planting are translated by Mr James Dickie at pp. 240-241 of his article "The Hispano-Arab Garden - its Philosophy and Function", *Bulletin of the School of Oriental and African Studies*, XXXI, 1968, pp. 237-248.

20 Meyerhof and Sobhy (above, note 15), p. 130, No. 42.

21 ed. Banqueri, II, p. 275; ed. Clément-Mullet, II, p. 265.

22 *ibid*., II, pp. 280/270.

23 ibid., II, pp. 321/312.

24 This was particularly due to the medicinal use of substitutes for unobtainable drugs, whose names were transferred (M. Levey, Substitute Drugs in Early Arabic Medicine, Veröffentlichungen der Internationalen Gesellschaft für Geschichte der Pharmazie, NF, Band 37, Stuttgart 1971).

25 Clēment-Mullet (above, note 11), II, 267.

26 See M. Levey, The Medical Formulary of Al-Kindi (Madison, University of Wisconsin Press 1966) p. 331.

27 On the rose see C.C. Hurst in Graham Thomas, The Old Shrub Roses (4th ed., 1963); and R. Gorer, The Development of Garden Flowers (1970), pp. 87-105.

28 M. Levey & N. al-Khaledy, The Medical Formulary of Al-Samarqandi (Philadelphia 1967), p. 230.

29 Ibn al-'Awwam, II, 279/269.

30 See above, note 19. The literary list is considerably shorter than the technical-scientific one, as might be expected, but it is noteworthy that it includes the trumpet daffodil (narjis qadushi) and the carnation (qaranful), and what may be the red anemone or a poppy (shaqir, or shaqiq al-nu'man), as well as acanthus and thyme, as additions. The 'literary' plants are marked with an asterisk* on our lists.

31 A.B. Emden, A Biographical Register of the University of Oxford to A.D. 1500, II (1958), 1315; for Adelard and the general background see C.H. Haskins, Studies in the History of Mediaeval Science (New York 1924/1960).

32 The famous king of Aragon, Jaime I el Conquistador (1208-76), was born at Montpellier.

33 For the Jardin des Plantes at Montpellier see Gardener's Chronicle, 4 January 1964.

34 Chapter xx.

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JOHN H. HARVEY

GARDEN PLANTS OF MOORISH SPAIN: A FRESH LOOK

THE OUTSTANDINGLY successful tour of gardens in Andalusia by the Garden History Society in the early summer of 1974 led to reconsideration of the history of gardening in Spain and to a preliminary exploration of the vast literature in Arabic which in part survives from the Middle Ages.[1] This was necessarily superficial, particularly because of the rarity of the printed sources, which include texts translated into Spanish, French, German or — minimally — English. Now that more than fifteen years have elapsed the available bibliography has been notably enlarged. Late in 1975 appeared the long-awaited edition, with Spanish translation, of the *Treatise of Agriculture* by Ibn Luyūn, the famous 'Andalusian Georgics' of A.D. 1348.[2] This notable work crowned the career of the late Sra Joaquina Eguaras Ibáñez and laid open to the world a remarkable summary of the agricultural and horticultural knowledge of its time. Comparison with the almost exactly contemporary English 'Feate of Gardening' — also in verse — gives convincing proof of the relatively advanced state of the art in Muslim Spain as compared with that of north-west European Christendom.[3]

Perhaps even more important has been the recent publication by the Spanish government of a facsimile edition of the immense book of Ibn al-ᶜAwwām, dating from about 1180.[4] As an edition of the Arabic text, with a complete Spanish translation, this was originally published in 1802 by the Royal Library of Madrid, the outcome of many years of patient scholarship by José Antonio Banqueri, Canon of Tortosa. It was Banqueri's work that first displayed to the modern world the riches of horticultural knowledge which, for centuries, had lain buried in a very few ancient Arabic manuscripts. Within twenty years some of its information had reached Britain, where J. C. Loudon quoted 'Ebn-Alwan' as showing in his list that by the eleventh century (*sic*; really twelfth) the sorts of garden plants were 'more numerous than those which were cultivated by the Greeks and Romans'.[5] This important observation none the less did little to modify the tendency, in our relevant literature, to belittle the Arabic contribution to gardening. It is only within the last few years that there has been a notable reversion to an objective view of garden history.[6] Loudon's estimate of the important advances made

32 Christchurch Street East, Frome, Somerset BA11 1QH

by Moorish gardening is borne out statistically: only some 76 of the 157 or so plants in Ibn al-ᶜAwwām are found in Palladius (*c.* A.D. 380): the classical flora had been greatly increased.

The European herbals of the earlier Middle Ages contained a modest number of plants, for instance the 77 species included in the famous list of 'Macer Floridus', probably compiled in the first half of the eleventh century, of which about twelve were imported drugs not then known as living plants in western Europe.[7] By the time that the herbal attributed to Macer had achieved a general circulation its total had risen to 103 plants and imports in all. This was roughly equal to the number of different species cultivated at the court of Charlemagne (*c.* A.D. 800),[8] and also in the English lists of Henry the Poet (Henricus Anglicus) about 1300,[9] and of Master John Gardener (*c.* 1350).[10] It was not until Henry Daniel, about the same time, formed his botanical garden at Stepney beside London, with 252 different sorts of herbs, that there was a marked increase in the garden flora of northern Europe.[11]

Naturally there were substantial differences between the northern and southern floras for climatic reasons. On the other hand many food crops and physic herbs could be grown throughout Europe and the Mediterranean region. In fact 35 of the 100 species of plants listed by Master John Gardener in England were also among the plants grown in Moorish Spain between the tenth and the fourteenth centuries. Of the much longer list of 258 plants in the gardens of northern Europe (*c.* 800–1538), some 107 occur in the combined list of Moorish plants of Spain (*c.* 975–1348).[12]

The plants grown in Andalusia obviously included a considerable number which could not normally have been grown in the north in the open air: banana, caper, carob, colocynth, cotton, date-palm, henna, jujube, myrtle, oleander, olive, orange and other citrus fruits, pistachio, sesame, sugar-cane, watermelon. Other plants, reasonably or even perfectly hardy in England, were slow to arrive for reasons which it is hard to understand. Among these anomalies the chief is the cauliflower, an esteemed vegetable throughout the Near East and the Mediterranean well before the year 1000, yet unknown in Britain until the sixteenth century. Among fruits the apricot did not reach us until after 1540, though the peach was here by the thirteenth century. The azarole was another fruit tree which arrived late, and among ornamental plants the white jasmine and the Judas tree, neither of which appeared until the sixteenth century.[13]

Reverting to southern Spain, the interesting survival of the *Cordova Calendar* throws light on the garden flora at the height of the Omayyad Caliphate in the reign of al-Ḥakam II (al-Mustanṣir) in A.D. 961–76.[14] Though not primarily a garden book, but a weather almanac combined with a calendar of the Christian holy days of Spain, this lists a large number of fruit trees and crop plants with the dates for sowing or planting, and of the harvest. Again, the total number of plants is roughly 100, and it is of considerable significance that some of them are of ornamental rather than utilitarian interest.[15]

The number of sorts of plants grown steadily increased, as can be estimated by counting those mentioned in the three later source-books, of Ibn Baṣṣāl, Ibn al-ᶜAwwām, and Ibn Luyūn. Ibn Baṣṣāl, writing in Toledo about 1075–80, mentioned some 100 plants, but in a more complete edition quoted by Ibn al-ᶜAwwām (and perhaps compiled at Seville after 1085) there are another twenty-four species or varieties. Ibn al-ᶜAwwām, at Seville about 1180, names nearly 160 plants, and Ibn Luyūn of Almeria in 1348

roughly maintained this.[16] These totals were, of course, only of those trees and herbs regarded as worth growing, whether for practical or aesthetic reasons.

Between the tenth and eleventh century several noteworthy trees made their appearance as garden plants in Spain: the ash, the bead-tree (*Melia azedarach*), cypress, orange, two sorts of poplar and the arbutus; with a considerable number of culinary herbs, salads and condiments: caper, caraway, chufa, coriander, cumin, endive, parsley, orach, pea, savory, sesame, spinach, together with the industrial crops teasel and woad. Several highly decorative plants for the pleasure garden: the blue Morning Glory, forms of iris, the Madonna lily, wallflowers and stocks, and waterlilies were first listed, and medicinal plants too increased in number. This rapid expansion of the garden flora continued until the end of the twelfth century, but then virtually ceased, though the versified treatise of Ibn Luyūn perhaps does not provide a fair comparison with the massive encyclopaedia of Ibn al-ᶜAwwām. What can be said is that the four main sources available provide a consistent picture of what was being grown.

The identity of most of the listed plants is not in doubt, as many early Arabic dictionaries and herbals give comprehensive lists of synonyms. There is, however, a residue of species which cannot be precisely identified. It will be convenient to consider these here in the alphabetical order of English names, to correspond with the overall list (see Appendix). Hereafter the abbreviations C.C. for *Cordova Calendar*; I.A. for Ibn al-ᶜAwwām; I.B. for Ibn Baṣṣāl; I.L. for Ibn Luyūn, are employed.

Wild ANISE, **tamak**, was identified by Clément-Mullet as *Daucus gingidium* L.[17] I.A. quotes I.B. and others as stating that it was grown in the same way as fennel, and used like garden anise.

Kidney BEAN, **lūbiyā**, might be of more than one species, but *Vigna cylindrica* (L.) Skeels (*unguiculata*) is the most probable, though *Dolichos lablab* L. was probably grown as well.

BINDWEED, **liblāb**, was of four kinds according to I.B.: one with white flowers grown as a laxative physic herb, which should be *Convolvulus scammonia* L. Another with white flowers growing among bushes must surely be the very common *Calystegia sepium* (L.) R.Br.; but another wild form, with small white flowers, is likely to have been some unrelated climber such as *Cynanchum acutum* L., which on account of its scent might well have been grown in pleasure gardens. The fourth species, with a blue flower, was certainly *Ipomaea nil* (L.) Roth.

BOXTHORN, **ᶜausaj**, as described by I.A., was a spiny *Lycium* used for hedges, very likely *L. europaeum* L. There is, however, confusion in both ancient and medieval sources, with buckthorn, *Rhamnus* spp.

BUGLOSS, **lisān al-thaur**. This was certainly a boraginaceous plant, quite probably an *Anchusa*, but it figures only in the *Cordova Calendar* as flowering in April.

CLOVER, **qurṭ**, should normally mean *Trifolium alexandrinum* L., but in the Latin version of C.C. it is equated with '*alfasfasa*', lucerne, *q.v.*

DODDER, **kushūthā**, mentioned as being gathered as a simple in June, might be one of several species of *Cuscuta*, found widely as a parasite on other plants.

ELECAMPANE, appears both as **rāsin** and **janāḥ**, but the sources agree that these are synonyms for *Inula helenium* L.

HOUSELEEK, **hayy al-ᶜālam**, would in the Mediterranean region imply the tree house-leek, *Aeonium arboreum* (L.) Webb & Berth., as illustrated in the Vienna Codex of Dioscorides.[18]

IRIS, **īrīs**, **sūsan**, cannot be specified but normally included several distinct rhizomatous flags, *Iris florentina* L., *I. foetidissima* L., *I. germanica* L. and *I. pseudacorus* L. There is serious confusion with the genus *Lilium*, as the Arabic **sūsan** came to mean in Spanish usage *L. candidum* L. (*azucena*).[19]

The 'Macedonian bulb', **basal al-maqdūnis**, was possibly *Iris variegata* L.[20]

LUCERNE, **fiṣfiṣah**, *Medicago sativa* L., was certainly cultivated by I.A. and I.L., and presumptively much earlier at Cordova (see clover, above).

MALLOW, **mulūhīyā**, is primarily *Malva sylvestris* L. and *M. neglecta* Wallr. (*rotundifolia*), but includes several other species. The Arabic name **khaṭmī** likewise includes several different sorts of larger mallows: marshmallow, *Althaea officinalis* L.; the tree mallow, *Lavatera arborea* L.; the shrub mallow or Syrian ketmia, *Hibiscus syriacus* L., as well as the oriental hollyhock, *Alcea rosea* L.

MARIGOLD. In C.C. a plant called (**al-**)**bahār** in Arabic and in Latin *albear* was said to be in flower in December. The early sources equate this with the Latin *buphthalmum*, 'ox-eye', but as that is also said to have a flower red in the centre with yellow petals, the most likely identification is with *Calendula officinalis* L.

MARUM, **marw**, might mean one of several labiate plants, but is most probably Origan of Egypt, *Origanum maru* L.

MILK-VETCH, **baram**, is quoted from I.B. in I.A., but described as a form of 'Acacia' similar to the lupin, with a sweet white flower. Richard Gorer suggests that this agrees with *Astragalus lusitanicus* Lam., the Iberian milk-vetch.[21]

NARCISSUS. The generic term **narjis** refers to the common spring-flowering species, of which many are native to Spain, but the bulb described as **nisrīn**, flowering in autumn, appears to be *Narcissus elegans* Spach; and the bulbous **bahār ābyaḍ** appears to refer to *N. papyraceus* Ker-Gawler.

PARSLEY. The Arabic **karafs** is an ambiguous term, used for smallage and celery, forms of *Apium graveolens* L., as well as for parsley, *Petroselinum crispum* (Miller) A. W. Hill. It is probable that both plants were grown (see also SMALLAGE).

'PARSNIP', **shaqāqul**, is most probably *Pastinaca schekakul* Russ., but might include various related plants such as skirret, *Sium sisarum* L.; and forms of the true parsnip, *Peucedanum sativum* Bentham.

POLY, **jaᶜdah**, is strictly *Teucrium polium* L., but this seems unlikely in the context of C.C., where the reference is to the seasonal growth of greenstuff on the soil of Arabia in January. Richard Gorer suggests that species of *Artemisia* are more likely. In any case the reference is to a wild plant not grown in gardens.

POPLAR. In the medieval Castilian version of I.B. (Book V, pp. ΓЮЮЮ, ΓЮЙ) there are references to black and white 'elms', *olmos negrales* and *olmos aluares*, but the Arabic is lost. It is probable that this is a mistake for **álamos**, poplars, and this is confirmed by I.L., which refers to the **nashm āswad** (black poplar) and **nashm ābyaḍ** (white poplar), presumably *Populus nigra* L. and *P. alba* L.

SILK-VINE, **yāsamīn urkhuwānī** or 'purple jasmine' is probably *Periploca graeca* L., but it is also possible that *Syringa persica* L., Persian jasmine (lilac) is meant.

SMALLAGE, **karafs**, the wild plant from which celery was developed (*Apium graveolens* L.). The Arabic sources confuse it with parsley (q.v.).

White THISTLE, **bādāward**, is said in C.C. to be a simple gathered in August. The name is in origin Persian but its identity was disputed in the early sources, though it seems to have been accepted that it was some form of thistle or related plant, with a thick tall stalk and violet flowers. It has also been identified as *Volutarella divaricata* Bentham.

WOAD, **ḥabaq al-ᶜajab**. The plant concerned was a blue dye-stuff, probably not indigo, and therefore likely to be *Isatis tinctoria* L. In I.A. this is confused with bindweed (q.v.)

because of the use of **nīl** (indigo) in both names (**ḥabb al-nīl**, the blue-flowered Morning Glory, *Ipomoea nil* (L.) Roth.).

It may be useful to comment on the appearance of some of the more interesting garden plants, here again arranged in alphabetical order of their English names.

ARTICHOKE, **kharshaf**, is found in I.A. before the end of the twelfth century, roughly at the same time that it is mentioned by Abbess Hildegard in Germany.

ASPARAGUS, **halyūn, āsfarāj**, is described as of two kinds, wild and garden, but I.B. also refers to the transplanting of the wild sort into the garden to improve it. The asparagus of classical times, described by Theophrastus and Dioscorides, was the spiny *A. acutifolius* L.; but that of cultivation since the Middle Ages is *A. officinalis* L. It seems probable that the Moors discovered the superiority of this latter species, which is herbaceous.[22]

BEAN, KIDNEY, **lūbiyā**, was widely grown throughout the South, though quite unknown in north-west Europe (see above).

CAULIFLOWER, **qannabīṭ**, appears consistently through the Spanish lists, and was well known throughout the Near East and North Africa. Its very late transference to north-west Europe remains a puzzle.

HEMP, **qinnab**, does not appear until the twelfth century, although well known in classical times.

HOLLYHOCK, **khaṭmi**, appears in I.A. and seems to have reached England late in the thirteenth century from Spain, probably introduced by Eleanor of Castile, the queen of Edward I. As a highly ornamental plant, remarkably hardy in the North, it is one of the earliest additions to the strictly ornamental garden flora.[23]

LEMON, **līmūn**, was one of the later citrus fruits to appear in western Europe, in the twelfth century.

MEDLAR, **zuᶜrūr**, though well known in classical times, seems to have been relatively late in appearing in the southern garden flora.

PEA, **julbān**, was a very ancient crop in Europe but is not mentioned in the early Muslim period. This is the more surprising in that *pisos Mauriscos* were listed in about 800 by Charlemagne.

PLANE, **dulb**, although a famous sacred tree of the Middle East, did not appear in the West, whether Muslim or Christian, until the late twelfth century.

SHADDOCK (grapefruit), **bastanbūn, zanbūᶜ**, was like the lemon, one of the later citrus fruits to come into cultivation in the West.

SPINACH, **isfānaj**, was grown in Spain in the eleventh century and appears to have been known throughout southern Europe and the Mediterranean basin. In the north-west various greens were grown under the same name, but the true plant does not seem to have reached Britain, nor perhaps northern France, until the sixteenth century.[24]

Another source of information, slightly earlier than the work of Ibn Baṣṣāl, is the fragmentary translation of the lost *Compendium of Agriculture* by his predecessor Ibn Wāfid (1008–75). What survives mentions nearly 50 plants, of which 36 are included in our other sources and several cannot be identified. About eight species, however, are referred to that are not in the other lists, though they are not necessarily cultivated plants: caltrops, cyperus, Esparto grass, grass, juniper, maidenhair fern, rosemary, and terebinth.[25]

Although it emanates from eastern rather than western Islam, it seems relevant to quote also the *Treatise on Agriculture* (*Resālat al-filāḥa*), written in Persia or Central Asia

in the fifteenth century.[26] This constitutes the *Kitāb shajarat al-nihāl*, and is in much the same tradition as the Moorish sources of earlier centuries. This has sections upon shade trees, fruit trees, grapevines, ornamental plants, vegetables, salads, and herbs used as condiments. Some 40 species coincide with those in the western lists and only three are plants not named in the West: chicory (*Cichorium intybus* L.) whose flowers were recommended as a remedy for snakebite; watercress (*Rorippa nasturcium-aquaticum* (L.) Hayek) apparently substituted for garden cress; and mung bean (*Phaseolus* (*Vigna*) *aureus* Roxb. and *P.* (*Vigna*) *mungo* L.), rather than kidney bean, though mung bean does appear among peas in I.A. Thus we have, over a period of five centuries, a demonstration of the fundamental unity of Islamic gardening practice, from the tenth to the fifteenth centuries.

So far as these named crops from the Islamic world effectively reached northern Europe, it seems that they were transmitted through the Christian kingdoms of Spain, and perhaps especially by skilled gardeners working in Aragon, where relations between Muslim and Christian cultures were especially close. It is of particular note that the Spanish gardeners employed in England by Queen Eleanor of Castile shortly before 1290 were from Aragon and not from Castile.[27]

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5. J. C. Loudon, *An Encyclopaedia of Gardening* (London, 1822), 3rd edition (1825), Book I, ix, 290, p. 63.
6. See, notably, *The Oxford Companion to Gardens* (Oxford, 1986), e.g. articles on Islam, Middle East, Pleasance, Spain.
7. *Macri de Viribus Herbarum* (Naples, 1477, etc.); cf. G. Frisk (ed.), *A Middle English Translation of Macer Floridus* (Uppsala, 1949).
8. Charlemagne's 'Capitulare de Villis' is printed in *Monumenta Germaniae historica*, *Leges* II, vol. I (Hanover, 1883); see J. H. Harvey, *Mediaeval Gardens*, revised edition (1990), pp. 28–32.
9. Harvey, 'The Square Garden of Henry the Poet', *Garden History* XV. 1 (1987), pp. 1–11.

10. See note 3 above.
11. Harvey, *Mediaeval Gardens* (1990), pp. 118–19, 122, 159–62; 'Henry Daniel: a Scientific Gardener of the 14th Century', *Garden History*, XV. 2 (1987), pp. 81–93.
12. See the list of 258 plants in Harvey, *Mediaeval Gardens*, pp. 163–80.
13. Harvey, 'Garden Plants of around 1525: the Fromond List', *Garden History*, XVII. 2, (1989), pp. 122–34; the first references to jasmine and apricot as growing in England are in William Turner, *The Names of Herbes* (1548); neither is mentioned in his *Libellus de Re Herbaria* (1538) — see the facsimiles (London: The Ray Society, No. 145, 1965).
14. *Le Calendrier de Cordoue*, with French translation by Ch. Pellat (Leyden: E. J. Brill, 1961).
15. Bay, camomile, iris, jasmine, marigold, myrtle, narcissus, roses, stock and wallflower, violet.
16. Ibn Baṣṣāl, *Libro de Agricultura*, Arabic text with Spanish translation edited by J. M. Millás Vallicrosa and M. Aziman (Tetuan: Instituto Muley el-Hasan, 1955). The additional plants ascribed to Ibn Baṣṣāl by Ibn al-ᶜAwwām (see note 4 above) are wild anise, cress, dragons, elecampane, endive, feverfew, iris, 'Macedonian bulb' (? *Iris variegata*), lavender, marum, 'Nofaj' melon, millet, mint, mustard, 'Nisrīn' (? *Narcissus elegans*), orach, origan, parsley, pea, savory, teasel, milk vetch, waterlily, woad. See also J. M. Millás Vallicrosa, 'La traducción castellana del "Tratado de Agricultura" de Ibn Baṣṣāl, *Al-Andalus* XIII (1948), pp. 347–430; and notes 1 and 4 above.
17. See note 4 above; R. T. Gunther (ed.), *The Greek Herbal of Dioscorides* (1934), IV.89, p. 485.
18. This identity was suggested by Richard Gorer.
19. The 'lily' of C.C. (**sūsan**, *lilia* in the Latin version) mentioned as flowering in March, can only be an iris, as pointed out to me by Richard Gorer. In Spain, however, the derived name *azucena* has always been applied to *Lilium candidum*.
20. This identification is very uncertain.
21. Although translated by Banqueri as 'Acacia', the description cannot be reconciled with any of the plants usually so named.
22. Richard Gorer tells me that some species of *Ruscus* are also eaten in Mediterranean Europe as 'Wild Asparagus', but these can be discounted here, since the Arabic names are completely distinct.
23. Confusion over the various large mallows is by no means confined to Arabic nomenclature: in English the name 'holihok' was used originally for the marshmallow (*Althaea officinalis* L.), and for the tree mallow (*Lavatera arborea* L.) The earliest description in English which can only mean *Alcea rosea* L. (our garden hollyhock) is that by Friar Henry Daniel (*c.* 1380), when he gives the names '*rosa hispanica*, rose of Spayne' and '*rosa hyemalys*, wynter rose, and *malua hyemalis*, winter malue' to a plant growing tall without branches, with large flowers red or white, borne until winter. In his time it grew in very few places in England, and only if planted or sown.
24. For a discussion of the sources on spinach, see J. H. Harvey, *Mediaeval Gardens* (1981; 1990), p. 166.
25. J. M. Millás Vallicrosa, 'La traducción castellana del "Tratado de Agricultura" de Ibn Wāfid', *Al-Andalus* VIII (1943), pp. 281–332.
26. British Library, Oriental MS 1771, fols 157–269 (see *Encyclopaedia of Islam*, new edition, II, p. 910). I am deeply obliged to Paul Loft, who generously gave his time to providing an extemporary translation and commentary from the medieval Persian text, in any case a remarkable feat.
27. See J. H. Harvey, 'Queen Eleanor of Castile as a Gardener', *The Garden History Society Newsletter* 5 (Summer 1982), pp. 3–4.

APPENDIX

THE PLANTS GROWN IN SOUTHERN SPAIN IN THE MIDDLE AGES

This list is in alphabetical order of English names, for ease of comparison with several lists of plants grown in the north of Europe, especially that in my *Mediaeval Gardens* (1990), pp. 163–80. The letters A — F are used to show occurrence in the following works:

A *Le Calendrier de Cordoue* (C.C.), *c*. A.D. 961–76
B Ibn Wāfid, *Compendium of Agriculture* (I.W.), *c*. 1060
C Ibn Baṣṣāl, *Book of Agriculture* (I.B.), *c*. 1080
D Ibn al-ᶜAwwām, *Book of Agriculture* (I.A.), *c*. 1180
E Ibn Luyūn, *Treatise of Agriculture* (I.L.), 1348
F *Treatise on Agriculture* (Persian), *c*. 1450

Wild plants for which there is no evidence of cultivation have not been included.

A B C D E F	ALMOND	*Prunus communis* (L.) Fritsch	**lauz**
A C D E	ANISE	*Pimpinella anisum* L.	**anīsūn**
C D	WILD ANISE	*Daucus gingidium* L.	**tamak**
A C D E F	APPLE	*Malus domestica* Borkh.	**tuffah**
A C D E	APRICOT	*Prunus armeniaca* L.	**barqūq, mishmish**
D E	ARTICHOKE	*Cynara scolymus* L.	**kharshaf**
C D	ASH	*Fraxinus excelsior* L.	**dardār**
A C D E	ASPARAGUS	*Asparagus officinalis* L.	**halyūn, āsfarāj**
A D E	AZAROLE	*Crataegus azarolus* L.	**zaᶜrūr al-ᶜanṣarī**
A C D E	BALM	*Melissa officinalis* L.	**turunjān**
A	BALSAM-TREE	*Commiphora opobalsamum* (Kunth) Engler	**balasān**
A D E	BANANA	*Musa paradisiaca* L.	**mūz**
A B D E	BARLEY	*Hordeum vulgare* L.	**shaᶜīr**
A B C D E	BASIL	*Ocimum basilicum* L.	**ḥabaq**
A C D E	BAY	*Laurus nobilis* L.	**ghār, rand**
C D	BEAD TREE	*Melia azedarach* L.	**āzādirakht**
A B C D E F	BROAD BEAN	*Vicia faba* L.	**fūl, bāqillā**
A C D E	KIDNEY BEAN	*Vigna cylindrica* (L.) Skeels (*unguiculata*)	**lūbiyā**
A B C D E F	SPINACH BEET	*Beta vulgaris* L.	**silq**
C	BINDWEED	*Calystegia sepium* (L.) R.Br.	**liblāb, nabkat**
C D		*Convolvulus scammonia* L.	
C		? *Cynanchum acutum* L.	
C D		*Ipomoea nil* (L.) Roth	
A C D E	BLITE	*Chenopodium capitatum* (L.) Aschers	**baqla al-yamānīya, yarbūz**
B D	BOXTHORN	*Lycium europaeum* L.	**ᶜausaj**
B D E	BRAMBLE	*Rubus fruticosus* L.	**ᶜullīq**
A B	BUGLOSS	? *Anchusa* sp.	**lisān al-thaur**
D	BUTCHER'S BROOM	*Ruscus aculeatus* L.	**khaizurān**
A B C D E	CAMOMILE	*Chamaemelum nobile* (L.) All. (*Anthemis nobilis* L.)	**bābūnaj**
C D E	CAPER	*Capparis spinosa* L.	**kabbar**

C D E	CARAWAY	*Carum carvi* L.	**karwiyā**
B D E	CAROB	*Ceratonia siliqua* L.	**kharrūb**
A C D E	CARROT	*Daucus carota* L.	**jazar**
A C D E	CAULIFLOWER	*Brassica oleracea* L. *cauliflora*	**qannabīṭ**
A C D E	CHERRY	*Prunus cerasus* L.	**ḥabb al-mulūk**
A C D E	CHESTNUT	*Castanea sativa* Miller	**shāh-ballūṭ**
C D E F	CHICKPEA	*Cicer arietinum* L.	**ḥummas**
B C D	CHUFA	*Cyperus esculentus* L.	**ḥabb al-zalem**
A C D E	CITRON	*Citrus medica* L.	**utrujj**
A	CLOVER	*Trifolium alexandrinum* L.	**qurṭ**
A B C D E F	COLEWORT (Cabbage)	*Brassica oleracea* L.	**kurunb**
C D E	COLOCASIA	*Colocasia antiquorum* Schott	**qulqās**
A C D	COLOCYNTH	*Citrullus colocynthis* (L.) Schrader	**ḥanẓal**
C D E	CORIANDER	*Coriandrum sativum* L.	**kuzbarah**
A D E	COTTON	*Gossypium herbaceum* L.	**quṭn**
A C D E	CRESS	*Lepidium sativum* L.	**ḥurf**
A B C D E	CUCUMBER	*Cucumis sativus* L.	**qithā^c**
C D E	CUMIN	*Cuminum cyminum* L.	**kammūn**
A C D	BLACK CUMIN	*Nigella sativa* L.	**shunīz**
C D E F	CYPRESS	*Cupressus sempervirens* L.	**sarw**
A C D E F	DATE-PALM	*Phoenix dactylifera* L.	**nakhl**
A D	DILL	*Anethum graveolens* L.	**shabath**
A	DODDER	*Cuscuta epithymum* (L.) L.	**kushūthā**
C D	DRAGONS	*Dracunculus vulgaris* Schott	**lūf**
A C D E	EGG-PLANT	*Solanum melongena* L.	**bādinjān**
A C D E	ELECAMPANE	*Inula helenium* L.	**rāsin, janāḥ**
C D F	ENDIVE	*Cichorium endivia* L.	**sarīs, hindabā'**
A B D	FENNEL	*Foeniculum vulgare* Miller	**bisbās**
D E	FENUGREEK	*Trigonella foenum-graecum* L.	**ḥulba**
A C D	FEVERFEW	*Chrysanthemum parthenium* (L.) Bernh.	**uqḥuwān**
A B C D E F	FIG	*Ficus carica* L.	**tīn**
A	SYCOMORE FIG	*Ficus sycomorus* L.	**jummaīz**
C D E	FLAX	*Linum usitatissimum* L.	**kattān**
A	FLEA-SEED	*Plantago psyllium* L.	**qaṭūnā**
A D	FUMITORY	*Fumaria officinalis* L.	**shāhtiraj**
A B C D E F	GARLIC	*Allium sativum* L.	**thūm**
D E F	GHERKIN	*Cucumis sativus* L. var.	**khiyār**
A B C D E F	GOURD	*Lagenaria vulgaris* Ser.	**qar^c**
A B C D E F	GRAPE-VINE	*Vitis vinifera* L.	**karum**
D	HAWTHORN	*Crataegus monogyna* Jacq.	**maḍagh**
A B C D E F	HAZELNUT	*Corylus avellana* L.	**jilauz, nārjīl, fauqal**
D E	HEMP	*Cannabis sativa* L.	**qinnab**
A C D	HENBANE	*Hyoscyamus niger* L.	**banj**

A C D E	HENNA	*Lawsonia inermis* L. (*alba*)	**ḥinna^{c}**
D	HOLLYHOCK	*Althaea* (*Alcea*) *rosea* (L.) Cav.	**khaṭmī**
A	HOUSELEEK	*Aeonium arboreum* (L.) Webb & Berth.	**hayy al-^{c}ālam**
A C D E	IRIS	*Iris* spp.	**īrīs, sūsan**
C D	('Macedonian bulb')	*I. variegata* L.	**baṣal al-maqdūnis**
D	IVY	*Hedera helix* L.	**yidhra, qissūs**
A B D E	JASMINE	*Jasminum officinale* L.	**yāsamīn**
D E	YELLOW JASMINE	*Jasminum fruticans* L.	**yāsamīn al-āṣfar**
D F	JUDAS TREE	*Cercis siliquastrum* L.	**dādhī**
A D E	JUJUBE	*Zizyphus jujuba* Miller	**^{c}anāb, nabaq, zifzif**
C D	LAVENDER	*Lavandula* spp.	**khuzāmā**
C	LEADWORT	*Plumbago europaea* L.	**shaṭrīa**
A B C D F	LEEK	*Allium porrum* L.	**kurrāth**
D E	LEMON	*Citrus limon* (L.) Burm. fil.	**līmūn**
C D E F	LENTIL	*Lens esculenta* Moench	**^{c}adas**
A B C D E F	LETTUCE	*Lactuca sativa* L.	**khassa**
B C D E F	LILY	*Lilium candidum* L.	**sūsan**
D E	LUCERNE	*Medicago sativa* L.	**fiṣfiṣah**
D E	LUPIN	*Lupinus albus* L.	**turmus**
A C D E	MADDER	*Rubia tinctorum* L.	**fuwwah**
D	SHRUB MALLOW	*Hibiscus syriacus* L.	**khaṭmī**
D E	GARDEN MALLOW	*Malva neglecta* Wallr.	**mulūḥīyā**
D	TREE MALLOW	*Lavatera arborea* L.	**khaṭmī**
C	MANDRAKE	*Mandragora officinarum* L.	**luffāh**
A	MARIGOLD	*Calendula officinalis* L.	**bahār**
A C D E	MARJORAM	*Origanum majorana* L.	**mardadūsh, marzanjūsh**
A C D E	MARSHMALLOW	*Althaea officinalis* L.	**khaṭmi**
C D E	MARUM	*Origanum maru* L.	**marw**
D E	MEDLAR	*Mespilus germanica* L.	**zu^{c}rūr**
A C D E	MELILOT	*Melilotus officinalis* (L.) Pallas	**iklīl al-malik**
A C D E	MELON	*Cucumis melo* L.	**baṭṭīkh**
C D	MILK-VETCH	*Astragalus lusitanicus* Lam.	**baram**
A C D E F	MINT	*Mentha* spp.	**faudanaj, na^{c}na^{c}**
A C D E F	SILK MULBERRY	*Morus alba* L.	**firṣad**
A C D E F	BLACK MULBERRY	*Morus nigra* L.	**tūt**
D F	MUNG BEAN	*Phaseolus* (*Vigna*) *aureus* Roxb. P. (*Vigna*) *mungo* L.	**māsh**
A	MUSHROOM OF MALTA	*Cynomorium coccineum* L.	**ṭarathith**
A C D E F	MUSTARD	*Sinapis alba* L.	**khardal**
A B D E	MYRTLE	*Myrtus communis* L.	**ās, rāiḥan**
A C D E	NARCISSUS	*Narcissus* spp.	**narjis**
C D	AUTUMN NARCISSUS	*Narcissus elegans* Spach	**nisrīn**
A D E	WHITE NARCISSUS	*Narcissus papyraceus* Ker-Gawler	**bahār ābyad**

A C D E	YELLOW NARCISSUS	*Narcissus* spp.	**narjis āṣfar**
D E	NETTLE TREE	*Celtis australis* L.	**almīs**
A C D E F	HOLM OAK	*Quercus ilex* L. (etc.)	**ballūṭ**
D E	OLEANDER	*Nerium oleander* L.	**diflā**
A B C D E F	OLIVE	*Olea europaea* L.	**zaitūn**
A B C D E F	ONION	*Allium cepa* L.	**baṣal**
C D E	ORACH	*Atriplex hortensis* L.	**qaṭaf**
C D E F	SEVILLE ORANGE	*Citrus aurantium* L.	**nāranj**
A C D E	ORIGAN	*Origanum vulgare* L.	**ṣa^{c}tr**
C D E	PARSLEY	*Petroselinum crispum* (Miller) A. W. Hill	**karafs**
D	'PARSNIP'	*Pastinaca schekakul* Russ.	**shaqāqul**
C D E	PEA	*Pisum sativum* L.	**julbān**
A B C D E F	PEACH	*Prunus persica* (L.) Batsch	**khūkh**
A C D E F	PEAR	*Pyrus communis* L.	**kummathrā, ijjāṣ**
A C D E	PINE	*Pinus pinea* L.	**sanaubar**
A C D E	PISTACHIO	*Pistacia vera* L.	**fistiq**
D	PLANE	*Platanus orientalis* L.	**dulb**
D E	PLANTAIN	*Plantago* spp.	**lisān al-ḥamal**
A C D E F	PLUM	{*Prunus domestica* L. {*P. cerasifera* Ehrh.	**^{c}uyūn al-baqar**
A B C D E F	POMEGRANATE	*Punica granatum* L.	**rummān**
C E	BLACK POPLAR	*Populus nigra* L.	**nashm āswad**
C E	WHITE POPLAR	*Populus alba* L.	**nashm ābyaḍ**
C D	HORNED POPPY	*Glaucium flavum* Crantz	**māmīthā**
A C D E	OPIUM POPPY	*Papaver somniferum* L.	**khashkhāsh**
A C D	PURSLANE	*Portulaca oleracea* L.	**rijla**
A C D E F	QUINCE	*Cydonia oblonga* Miller	**safarjal**
A B C D E F	RADISH	*Raphanus sativus* L.	**fujl**
B D E F	REED	*Arundo donax* L.	**qaṣab al-qaṣṣābīn**
A C D E	RICE	*Oryza sativa* L.	**aruzz**
D	ROCKET	*Eruca sativa* Miller	**jirjīr**
A B C D E F	ROSE	*Rosa* spp.	**ward**
A B C D E F	RUE	*Ruta graveolens* L.	**sadhāb**
A C D E	SAFFLOWER	*Carthamus tinctorius* L.	**^{c}aṣfar**
A C D E	SAFFRON	*Crocus sativus* L.	**za^{c}farān**
C D E F	SAVORY	*Satureia* spp.	**shaṭrīya, ṣa^{c}tar**
D	SCREW-PINE	*Pandanus tectorius* Solander	**kādī**
A C D E	SEBESTEN	*Cordia myxa* L.	**sabastān**
A C D E F	SERVICE	*Sorbus domestica* L.	**mushtahī, ghubairā**
C D E	SESAME	*Sesamum indicum* L.	**simsim**
A	SESELI	*Ferula* spp.	**sisiliūs**
D	SHADDOCK (Grapefruit)	*Citrus maxima* (Burm.) Merr.	**bastanbūn, zanbū^{c}**
D	SILK-VINE	? *Periploca graeca* L.	**yāsamīn urkhuwānī**
A B D E	SMALLAGE	*Apium graveolens* L.	**karafs**

D	SORREL	*Rumex acetosa* L.	**hummāḍ**
C D E	SPINACH	*Spinacia oleracea* L.	**isfānaj**
A	STAVESACRE	*Delphinium staphisagria* L.	**habb al-rās**
A C D E	STOCK	*Matthiola incana* (L.) R.Br.	**khairī**
C D	STRAWBERRY TREE	*Arbutus unedo* L.	**^{c}aṭlab**
A D E	SUGAR-CANE	*Saccharum officinarum* L.	**qaṣab al-sukkar**
A D	SUMACH	*Rhus coriaria* L.	**summāq**
D E	TARES	*Vicia* spp.	**kasnā, karsanah**
C D	TEASEL	*Dipsacus fullonum* L.	**shūk al-darākhīn**
A E	THYME	*Thymus* spp.	**ṣa^{c}tar, sharrīn**
A B C D E	TURNIP	*Brassica rapa* L.	**lift, siljam**
A C D E	VIOLET	*Viola odorata* L.	**banafsaj**
C D E	WALLFLOWER	*Cheiranthus cheiri* L.	**khairī**
A C D E F	WALNUT	*Juglans regia* L.	**jauz**
F	WATERCRESS	*Rorippa nasturcium-aquaticum* (L.) Hayek	**jarjīr**
C D	WATERLILY	*Nymphaea alba* L.	**nīlūfar**
A B C D	WATERMELON	*Citrullus vulgaris* Schrader	**dalā^{c} al-hindī, baṭṭīkh al-sandī**
A B D E F	WHEAT	*Triticum aestivum* L.	**qamḥ**
D E	WILLOW	*Salix* spp.	**ṣafṣāf**
C D	WOAD	*Isatis tinctoria* L.	**? ḥabaq al-^{c}ajab**
A C D E	WORMWOOD	*Artemisia absinthium* L.	**ifsintīn**

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Economic Botany and Ethnobotany in Al-Andalus (Iberian Peninsula: Tenth–Fifteenth Centuries), an Unknown Heritage of Mankind[1]

J. Esteban Hernández Bermejo, and Expiración García Sánchez

Hernández Bermejo, J.Esteban *(Jardín Botánico de Córdoba and Departamento de Ciencias y Recursos Agrícolas y Forestales, Universidad de Córdoba, Apdo. 3048 Córdoba, Spain), and* **Expiración García Sánchez** *(Escuela de Estudios Arabes, C.S.I.C., Cuesta del Chapiz, 22, Granada, Spain).* Economic Botany and Ethnobotany in Al-Andalus (Iberian Peninsula: Tenth–Fifteenth Centuries), an Unknown Heritage of Mankind. *Economic Botany 52(1)15–26. 1998. The Hispano-Arabic culture in the Iberian Middle Ages is a major chapter in the history of the use and knowledge of plants. The Andalusi agronomists, botanists and physicians assimilated their heritage of Iberian, Hispano-Roman, and Hispano-Visigothic cultures with North-African and Eastern influences. They developed a profound knowledge of the plant world and managed a high diversity of species. A part of this ethnobotanical and agronomic heritage was transmitted not only to the local cultures and generations that followed, but also to peoples on the other side of the Atlantic Ocean by the Spanish colonists in the New World. This paper presents a study of the principal works of the so-called Andalusi Agronomic School (10th–15th centuries) and their agronomist authors: Arib ben Said, Ibn Wafid, Ibn Hayyay, Abu l-Jayr, Ibn Bassal, al-Tignari, Ibn al-Awwam and Ibn Luyun. We also raise questions about Andalusi ethnobotany, the introduction of Oriental species in the Iberian Peninsula and the prospects for ethnobotanical research through the philological study of Hispano-Arabic writings.*

La Botánica Economica y la Etnobotánica en Al-Andalus (Península Ibérica, Siglos Diez-Quince: un Patrimonio Desconocido de Humanidad). *La cultura hispanoárabe que se desarrolla durante el Medioevo Ibérico incluye un capítulo destacado relativo al uso y conocimiento de las plantas. Los agrónomos, botánicos y médicos andalusies asimilan el patrimonio de sus culturas predecesoras (ibérica, hispanorromana, hispanovisigoda) y junto a las influencias orientales y norteafricanas de su época, alcanzan un gran conocimiento del mundo vegetal manejando una elevada diversidad de especies. Una parte de este patrimonio etnobotánico y agronómico será transmitido más allá de su ámbito temporal y geográfico, alcanzando incluso el otro lado del Atlántico, a través de los colonos españoles en el Nuevo Mundo. Este trabajo nos introduce en el estudio de los principales autores y obras de la llamada Escuela Agronómica Andalusí (siglos 10–15). Entre los agrónomos estudiados se encuentran, Arib ben Said, Ibn Wafid, Ibn Hayyay, Abu l-Jayr, Ibn Bassal, al-Tignari, Ibn al-Awwam e Ibn Luyun. Se plantean algunas cuestiones sobre la existencia de una etnobotánica andalusí, sobre la introducción de especies orientales en la Península Ibérica, y sobre las perspectivas de la investigación etnobotánica a través del estudio filológico de las obras y autores hispanoárabes.*

Key Words: al-Andalus; Andalusi agronomic school.

The crucial role played by the Iberian Peninsula in the introduction and exchange of species between the European and American continents is an unquestionable fact that has been object of numerous works and will still be a major subject for future research.The years immediately prior to 1992 were especially significant for conducting investigations on the exchange of species and cultures between American and European peoples. Most contributions have analyzed the impressions of the first Spanish explorers, colonists, farmers, chroniclers, physicians and naturalists after their arrival in America and the species transported by them (Crosby 1991; Dawson 1960; del Río Moreno 1991; Estrella 1986; Watson 1983). In contrast, we could point to the depth of knowledge of the transport of American species into Europe from eighteenth century onward (García Paris 1991) and what took place

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in this regard in the sixteenth and seventeenth centuries (Hernández Bermejo and Lora González 1994; Hernández Bermejo and León, eds. 1995; Lora González 1994).

The role and influence of Spain in the transport of species from the Old World and the transfer of its traditional techniques, habits, and culture, cannot be understood without knowledge of the origin and history of the Mediterranean, European, and Iberian cultures and species. These, together with other Asian and African influences, took form over several millennia and gave rise to the agriculturally based cultures and landscapes and to the diversity of useful plant species that define the ethnobotanical and agricultural framework of Spain in the fifteenth century.

Over 135 million years, the Iberian Peninsula has been linked intermittently two major land masses before the appearance of humans. Later during the Meso- and Neolithic Ages, it was a gateway between North Africa and the southern Europe as well as the terminus of the long transport processes from the East to the West along the Mediterranean coasts and islands. During the millennium prior to the Christianity, the Phoenician, Greek, Carthaginian and Roman colonizations took place north of the Iberian Peninsula. After the first century, the Roman Empire promoted trade from Asia Minor, Africa and the Mediterranean basin. After the fall of the Roman Empire in the fourth century, the Visigothic Kingdom was established in the Iberian Peninsula and was influenced by the Byzantine Empire, especially during the sixth and seventh centuries. With this flow of empire over the centuries came the transfer from the East to West of crop, medicinal and aromatic plants.

In order to understand the legacy transmitted by the Iberian cultures and peoples to America it is important to begin in the eighth century and to focus on the tenth century and later. We are referring to the Hispano-Arabic Period, known by the historians as the Andalusi Period. It is convenient to clarify that al-Andalus was not only the southern region that it is known today as Andalusia, but the whole of the Iberian territory under Moslem domination. This historical period begins with the invasion of Tarik and the defeat of the Visigothic King Rodrigo in the battle of the Lake of La Janda in the year 711 and ends with the conquest of Granada by the Catholic Monarchs in 1492. From a cultural viewpoint, however, the roots and culmination of this period are not so precise and, in any case, its splendor does not take such a long time to develop. Therefore from our point of view, we consider the Andalusian Period to cover the tenth to fifteenth centuries.

From an ethnobotanical point of view, the consequences of this period can be observed through very different contributions: species of agricultural interest introduced from Asia to Africa, other plants previously known but now grown as main crops, new agricultural techniques (Glick 1988), management and knowledge of countless medicinal plants and promotion of the scientific disciplines such as natural history, botany, pharmacology and medicine. The results were contained in many works and treatises, some of which have survived to our time. Moreover this knowledge has been transmitted since then through oral tradition. The so-called Reconquest of the Christian Kingdom interrupted the formal transmission of this heritage, by destroying documents and "forgetting" authors. But it would not eliminate the local culture that would conserve techniques, habits and plant varieties through generations. Much of this knowledge was carried to the American continent by the first Spanish explorers, colonists, and farmers. The rescue of this Andalusi ethnobotanical heritage is of great interest in order to recover neglected species and forgotten knowledge. And it can also be used in economic botany and ethnobotanical studies in America as a documentary source for understanding the origin and nature of a great part of the Old World's contributions to the New World.

We must recognize the existence of certain deficiencies in this source of information. Most of the original manuscripts were lost and ill-treated from the fifteenth century to the Enlightenment (eighteenth century). The documents were written originally in Arabic but only in a few cases were translated into other languages. Furthermore, there was poor communication between the fields of philology and arabism and those of botany, agronomy, pharmacology and ethnobotany. Our paper attempts to overcome this problem. Finally the difficulties for the translation and identification of the texts are noteworthy, especially as regards the agricultural species and terms used (Issa 1926). We have pointed out these problems and outlined the multidisciplinary method to solve them (Hernán-

dez Bermejo 1987; 1991). Some Arabists have confused Asian crops introduced into Europe with American species (for example, *Musa paradisiaca* with *Opuntia ficus indica,* or *Aloe vera* with *Agave americana*). More mistakes appear when the original translation from Arabic into Latin, or a modern language, is translated again into another modern language. These preliminary misidentifications have led scholars to underestimate the possibilities of the scientific analysis of these texts.

Biodiversity and Iberian Ethnobotanical Heritage Before the Andalusi Period

The biodiversity of the economic flora of the Iberian Peninsula began with the autochthonous species:

Forest Trees of Edible Fruit

Several species of the Mediterranean forest were used because of their fruits and a domestication process was initiated (still not finished today). Species of the genus *Quercus* must be pointed out (evergreen oak *Q. ilex,* cork oak, *Q. suber,* gall oak *Q. faginea*). Others, in a wild state in certain regions of the Iberian Peninsula could have been subject to very ancient transport, as it is the case of *Corylus avellana* (hazelnut), *Castanea sativa* (chestnut) and *Pinus pinea* (pine).

Fruit Trees

There were many different tree species of the Rosaceae family with edible fruits as *Crataegus monogyna* (hawthorn), *Pyrus* spp. (wild pear), *Sorbus aucuparia, S. aria* (rowan), *Prunus* spp. (*P. avium, P. mahaleb, P. spinosa*). Other edible fruits were those of *Myrtus communis* and *Arbutus unedo,* as well as those of southern species that could be easily introduced into the southern Iberian Peninsula: *Prunus avium* (sweet cherry) and *Malus domestica* (apple).

Cereals

Some wild species of *Hordeum* (barley) and *Avena* (oat) were originally used.

Legumes

Different species of the genera *Lathyrus* (vetchlings), *Vicia* (vetches) and *Lupinus* (wild lupines).

Vegetables

Several species of Apiaceae, Asteraceae, Boraginaceae, Chenopodiaceae, Cruciferae and Liliaceae could be used as wild or cultivated vegetables because of their leaf, fruit or root. For example, *Apium* (celery), *Daucus* (carrot), *Anchusa* and *Symphytum* (bugloss), *Lactuca* (wild lettuce), *Cichorium* (chicory), *Chenopodium* (goose-foot), *Rumex* (dock), several cardoons such as *Scolymus* spp. *Silybum marianum* and even *Cynara cardunculus.* Also *Asparagus* spp. (asparagus), *Beta vulgaris* (beets), *Silene* spp. (campion), *Diplotaxis* spp. and *Brassica* spp., *Raphanus sativus* (radish), *Lepidium* spp. (peppergrass), *Nasturtium* spp. (watercress), *Atriplex* spp. (orach) and *Allium* spp. (wild garlic and onions). Other sources of carbohydrates: Flours were obtained from the seeds of plants such as *Polygonum* spp. and *Chenopodium* spp. or from fern roots (*Pteridium aquilinum*).

Spices, Aromatic Species

The first Iberian settlers and farmers found a very diverse flora in spices such as: *Capparis* spp. (caper bush), *Laurus nobilis* (laurel), *Sinapis* spp. and *Brassica nigra* (mustard), *Foeniculum vulgare* (fennel), *Ruta graveolens* (rue), several Lamiaceae as *Rosmarinus officinalis* (rosemary) and *Origanum vulgare* (marjoram), and many species of other genera such as *Mentha* (mint), *Satureja* (savory), *Thymus* (thyme) and *Lavandula* spp. (lavender).

Joining the autochthonous species, economic plants from Central Europe, the Balkan and Italic Peninsulas, Africa, Asia Minor and even from Eastern Asia had arrived over several millennia in the western Mediterranean basin prior to the Arabic period. The chronology of this gradual enrichment can be established through the works of naturalists, physicians, agronomists and some Greek and Roman writers (Estrabo, Pliny, Dioscorides, Virgil) and even better through some Hispano-Roman and Hispano-Visigothic authors (Columella, Isidorus of Seville). This allochthonous component in the Iberian Peninsula added over the Neolithic to the Spanish-Roman Period includes:

Fruit Trees and Forest Species of Edible Fruits

Olea europaea (olive) and *Vitis vinifera* (grape), perhaps completely allochthonous from the eastern Mediterranean, became the main

woody crops of the Iberian Peninsula. Other allochthonous species, such as *Ceratonia siliqua* (carob), *Celtis australis* (hackberry), *Ficus carica* (fig) and *Juglans regia* (walnut) acquired a wide distribution, and even became feral. The use of species such as *Pinus pinea* (pine) and *Castanea sativa* (chestnut) was consolidated and intensified. Other species introduced were *Pyrus communis* (pear), different oriental species of *Prunus* like *P. domestica* (plum), *P. armeniaca* (apricot), *P. persica* (peach) and *P. dulcis* (almond), *Phoenix datylifera* (date palm), *Cydonia oblonga* (quince), *Mespilus germanica* (medlar), *Ziziphus lotus* (jujube) and *Punica granatum* (pomegranate).

Cereals

Wheat (*Triticum* spp.), barley (*Hordeum vulgare*) and rye (*Secale cereale*) together with sorghum, millets and broomcorn (*Sorghum vulgare, Panicum miliaceum, Setaria* spp.) became the main source of carbohydrates.

Legumes

Important legumes had already arrived from Western Asia such as: *Cicer arietinum* (chick pea), *Vicia faba* (broad bean), *Lens culinaris* (lentil), *Pisum sativum* (pea) and *Vigna sinensis* (cowpea), as well as other species of *Lathyrus* and *Vicia.*

Vegetables

Species such as *Brassica napus* (rape), *B. oleracea* (cabbage, kale), *Lactuca sativa* (lettuce), *Apium graveolens* (celery), *Smyrnium olosatrum* (alexanders), *Allium cepa* (onion), *A. sativum* (garlic), *Lagenaria siceraria* (bottlegourd) were cultivated.

Spices, Aromatic Species

The rich autochthonous component was also enriched by other Oriental and European species such as *Coriandrum sativum* (coriander), *Petroselinum crispum* (parsley), *Carum carvi* (caraway), *Cominum ciminum* (cumin), *Pimpinella anisum* (anise), *Carthamus tinctorius* (safflower) and *Anethum graveolens* (dill, anethum).

This catalogue of indigenous and introduced useful species of Visigothic Hispania prior to Arabic colonization was lengthy and diverse.

The Andalusi Agronomic School: Origin, Influences, Principal Authors, Evolution

Agriculture in the Iberian Peninsula reached a somewhat productive level before its splendid achievements during the Roman colonization. Afterwards it entered into a phase of stagnation and even regression during the Visigothic period.

A new and deeper agricultural development in the Iberian Peninsula began with the arrival of the Arabs in the eighth century the Andalusi scientists started to make original contributions in the tenth century. In addition to the new tendency to become independent from the eastern culture and science, a series of elements and circumstances converged in al-Andalus that would be the embryo of the so-called "Andalusi Agronomic School" It would reach zenith in the eleventh and twelfth centuries (García Sánchez 1992). The principal agronomist-writers of the Andalusi Agronomic School were:

Tenth Century

Arib ben Said: Historian, agronomist, physician and veterinarian from Cordova. *Calendario Agrícola* (translation by Pellat 1961)

Andalusi anonymous: Unknown author from Cordova. *Tratado Andalusí de Agricultura* (translation by López López 1990)

Eleventh Century

Ibn Wafid: Physician and agronomist from Toledo. *Compendio de Agricultura* (translation by Millas Vallicrosa 1943)

Ibn Hayyay: From Seville. Lo que basta saber sobre Agricultura (translation by Carabaza 1988; 1994; interpreted by Bolens 1981) *Plantas en al-Andalus en el siglo XI* (Carabaza 1994)

Ibn Bassal: Agronomist from Toledo. *Tratado de Agricultura* (translation by Millas Vallicrosa and Aziman 1955. Interpreted by García Sánchez and Hernández Bermejo, 1995)

Abu al-Jayr: From Seville. *Tratado de Agricultura* (translation by Carabaza 1994)

al-Tignari: From Granada. *Esplendor del jardín y recreo de las mentes* (translation and interpretation by García Sánchez 1987, 1988)

Twelfth Century

Ibn al-Awwam: Agronomist from Seville. (Abu Zacarías) *Tratado de Agricultura* (translation

by Banqueri 1802; interpretation by Hernández Bermejo and García Sánchez 1988)

Fourteenth Century

Ibn Luyun: From Granada. *Tratado de Agricultura* (translation by Eguaras 1975)

The Andalusi Agronomic School took the first steps in Cordova during the Caliphate Period within the group of physicians, chemists and botanists associated with the monarchs Abd al-Rahman III (912–961) and his son al-Hakam II (961–976). One of most influential factors for the development of pharmacology and botany and, consequently, of agronomy was Dioscorides' *Materia Medica* (Dietrich 1988), a copy of which the Byzantine Emperor Constantino VII Porfirogeneta sent to the Cordovan Caliph Abd al-Rahman III.

Nevertheless the most decisive event for the appearance of the Andalusi Agronomic School was the edition of the *Calendario de Córdoba* by Arib ben Said. This work of the tenth century is of vital importance for the study of botany and agriculture in Spain during the Moslem domination (Dozy ed. 1961). Many of the plant species introduced by the Arabs into the Iberian Peninsula are documented in this work for the first time. Also mentioned is the cultivation of many other species that were already acclimatized in the territory and whose use and cultivation were encouraged by them.

There is another text of the end of the tenth century, *Tratado Andalusí de Agricultura* (anonymous), that is probably the first written agronomic treatise in al-Andalus (López López 1990).

The climax of this agronomic school that led to the "Andalusi agricultural revolution" took place in a very specific historical moment: the decentralization period instituted by the Moorish Kingdoms after the breaking up of the Caliphate of Cordova (eleventh century). Moreover other factors were added: 1) A comprehensive translation program of documents on the Greek-Roman, Byzantine and mainly Mesopotamian agronomic heritage (eighth-tenth centuries) carried out in the Moslem East; 2) The advances in medical, pharmacological and botanical studies initiated in Cordova in ninth-tenth centuries; and 3) The urban development that, when facing the problem of food supply in the Hispano-Arabic cities, spontaneously encouraged research projects towards the promotion and improvement of the agricultural sector (Lagardère 1993). In addition, the new Arabic settlers took advantage of the richness of the Iberian soil and of the important Hispano-Roman agricultural tradition (El-Faïz 1996).

In the eleventh century, the "School" founded in Cordova was transferred first to Toledo and then to Seville, and a close relationship with Granada was maintained. Despite the subsequent cultural and political decline, the *Poema Agrícola* by Ibn Luyun was written in the second half of the fourteenth century.

Few biographical data of these authors are known. This condition, together with the miscellaneous and summarized state of the Andalusi agricultural manuscripts, has made it quite difficult to study their works (Ullmann 1972). We have only limited information of those who were well known in other scientific fields. For example Ibn Wafid was a physician and chemist from Toledo and whose teachings were followed by another Andalusi agronomist, Ibn Bassal.

Ibn Bassal stands out above all the Andalusi authors for his personality. His knowledge was mainly based on his personal experience. After the reconquest of the Moorish Kingdom of Toledo by the Christians (1085), Ibn Bassal (like the rest of the intellectuals of the city) moved to Seville which then became the headquarters of the "school."

Abu al-Jayr, from Seville, appears by that time. Little is known about his theoretical-practical work, except some indirect information through other authors. Perhaps the best representative of the theoretical approach is Ibn Hayyay, about whom no biographical data are available. In contrast to his contemporary Ibn Bassal (1073), he compiled an impressive mosaic of quotations from previous authors, some of which are compared with his own experience. Studies of his work (Bolens 1981) show the influence of the Latin agronomic tradition, especially of Columella. This interpretation is considered suggestive but remains controversial.

Al-Tignari was the last author of the eleventh century, although his work came out in the first decade of the twelfth century. He was born on a farm near Granada. He was a physician, as well as a good writer and an excellent poet. After having travelled through North Africa and the Near East, he went back to al-Andalus, and lived in Granada and Seville. In Seville he

joined the group of agronomists and botanists associated with Ibn Bassal. Only half of his original manuscript is preserved but his work, in which theory and experience in fields like medicine, botany and linguistics are united, is one of the most ordered and systematic of the Andalusi agronomic treatises.

The encyclopedia on rural economy by Ibn al-Awwam came to light one century later. It was the only reference for Spanish-Moslem agronomy available for a long time and, paradoxically, little is known about the author except that he lived in Seville in the twelfth-thirteenth centuries. One of the merits of his agricultural treatise is that it includes an enormous number of citations from Andalusi and oriental texts. Therefore, besides being a compilation of the previous agronomic theories, it can help to identify some original texts (mainly by Spanish-Moslem authors) which are not known in their complete form. This book is one of the few intact works and presents all the zootechnic and agricultural knowledge of that time. It contains traditional information as well as that obtained through his own experience.

The last known work of the Andalusi agriculture is a didactic poem by Ibn Luyun (1349) from Almeria. It contains agricultural information, mainly obtained from the treatises by Ibn Bassal and al-Tignari. It is one of the few agricultural works that, along with the one by Ibn al-Awwam, is complete, which is unusual for Andalusi agronomic literature (Hernández Bermejo and García Sánchez 1988).

All of these authors acquired their knowledge from different sources: the first and most important source was the Greek-Byzantine eastern tradition; second, the Latin tradition, that undoubtedly existed, although the details of its transmission is not so well known as that of the Greek; and finally the assimilation of autochthonous knowledge comprising the Latin-Mozarabic heritage. In addition to these sources we must consider the knowledge gathered and transmitted in the *Agricultura Nabatea,* the first great Arabic work on agriculture, which represented the Mesopotamian tradition at the beginning of the tenth century.

Evaluation of the Andalusi Ethnobotanical Heritage: the Agricultural Treatises

The Andalusi treatises, especially the complete ones, follow the pattern of those of the classic Roman and Greeks, and Eastern cultures. Initial chapters focus on lands, waters, fertilizers, followed by plant crop issues and finish with zootechnology and veterinary practices. Agricultural calendars are usually included in these treatises along with astronomical and meteorological calendars and references to magic, local traditions, and experiences of the farmers. They conclude with practices of farm management, control of crop pests and diseases, and recommendations on the physical and moral factors to be considered when selecting the workers and persons in charge of the farm operation.

Some of these treatises, such as the *Libro de Agricultura* by Ibn Bassal, are eminently practical. They were written by agricultural technicians and were of great utility for the farmers of that time. The original and very interesting *Agricultural Calendar* by Arib ben Said describes not only the landscape but also the Mediterranean agricultural cycle of one thousand years ago. Other encyclopedic works cite authors, describe different experiences, and lead to rigorous scientific conclusions. An outstanding work of this type is the book by Ibn al Awwam.

The interest of some of these treatises in topics that today are characteristic of the concern for sustainable or ecological agriculture is noteworthy. It is remarkable to encounter, for example, the obsession for recycling nutrients, the appropriate use of manure, the preventive aspects of pest and disease management, the control techniques based on natural repellents, and treatments (that today are considered as phytohormonal) to facilitate vegetative propagation and rooting.

Another valuable insight gained when interpreting the agricultural structure and landscape described in these works is that they reflect the management of a very high biological diversity. The number of species mentioned in almost all these treatises is not only greater than that of previous cultures, but it is also greater than that of other contemporary and subsequent agricultural systems and surveys (Herrera 1513) of the surrounding Christian Kingdoms. Agriculture in the Christian Kingdoms was organized to provide a diet based on the trilogy of meat-wheat-wine and was a less varied and drier agriculture. In contrast with this system, the water management in irrigated lands, the establishment of orchards in valleys and on river banks and the cultivation of dry land, tree crops (almonds, carobs,

oaks, figs, jujubes, pistachios and wine grapes) made the Hispano-Arabic agriculture and way of living and food much more complex. Diversity of the agricultural landscape was accompanied by the knowledge and management of a large number of cultivars. Some authors describe in detail their morphological differences and uses.

Part of this diversity includes crops that have been lost or neglected in modern agriculture, such as *Silybum marianum, Cichorium intybus, Eruca sativa* and *Smyrnium olosatrum.* Some others disappeared in the Iberian agriculture but are still cultivated in other regions of the world, *Zizyphus lotus, Pistacia vera, Portulaca oleracea, Vigna sinensis* . Finally some are nearly extinct in our region of reference but were introduced into America, such as *Cichorium intybus, Vigna sinensis, Coriandrum sativum* and *Lathyrus vulgaris.*

An example of this type is the work by Ibn Bassal from Toledo. He is far from being a very exhaustive author and his work is one of the less extensive ones because it focused on practical matters rather than theoretical aspects. According to our recent review and analysis (Table 1), the species cited by this author could represent the basic agricultural flora in the eleventh century. Nevertheless, we should be aware that this catalogue is not a complete work, but only a summary. The lack of significant information concerning cereals and other dry-land crops in this work may only be the result of the incompleteness of what is available to us.

Another aspect of great interest is the gradual arrival of Oriental species. It is possible to recreate one of the most interesting chapters of the dispersion process of agricultural species by specifying the chronology of their introduction, the effective establishment of their cultivation and the evolution of their different uses and varieties. We have already dealt with these subjects by comparing the incremental references to Asian and African species by Spanish-Roman, Spanish-Visigothic authors and by the principal Andalusi agronomists in the tenth to fourteenth centuries (Hernández Bermejo 1991). Table 2 shows some of the species introduced during this period.

At this stage of our study we find it advisable to make only a preliminary interpretation of these lists. In addition to the methodological difficulties aforementioned, there are also some doubts concerning whether the species were only known and consumed or were also cultivated. For instance, some of the plants whose introduction into the Iberian Peninsula has been traditionally attributed to the Arabs, were already cited by Isidorus of Seville in the seventh century (ed. 1982). This is the case of the sugar cane (*Saccharum officinarum*), citron tree (*Citrus medica*), mulberry (*Morus* spp.), saffron (*Crocus sativus*), some species of cotton (*Gossypium* spp.), pepper (*Piper nigrum*), ginger (*Zingiber officinale*) and many species of cinnamon and camphor (*Cinnamomum* spp.).

These doubts still remain among the Hispano-Arabic authors. Probably some of the species mentioned by them were never cultivated in the Western Mediterranean because of their tropical character. This may be the case of pepper (*Piper nigrum*), indigo (*Indigofera indica*), cinnamon (*Cinnamomum zeylanicum*), or snowbell (*Styrax officinale*). Others, such as henna (*Lawsonia inermis*) or tree cotton (*Gossypium arboreum*) not present in contemporary Iberian agriculture, were established crops in that time. Other species were common crops that have been neglected or even totally forgotten today e.g., *Pistacia vera, Zizyphus lotus, Vigna sinensis, Linum usitatissimum, Cannabis sativa, Lepidium sativum, Eruca sativa, Portulaca oleracea, Cichorium intybus, Silybum marianum, Myrtus communis* and *Urginea maritima.* A comprehensive research program on this subject would surely lead to the recovery of certain crops.

ANDALUSI ETHNOBOTANY

THE ORAL TRADITION

In the written records of Andalus there are many evidences of the importance of direct experience and of the oral transmission of knowledge. Thus, Ibn al-Awwam (Banqueri 1802, reedited 1888), the Andalusi agronomist who compiled the greatest number of bibliographical sources, after mentioning them, ends by saying: "No sentence is expressed in my Work that I have not previously experienced many times." In other paragraphs we can find phrases such as: "It is said (by the farmers) that it is convenient . . . " On the other hand, authors like Ibn Bassal based their teachings on their own experience or on their contemporaries experience as farmers.

If an ethnobotanical tradition is understood to emphasize the oral transmission of plant knowl-

TABLE 1. SPECIES IDENTIFIED IN THE *LIBRO DE AGRICULTURA* BY IBN BASSAL IN THE ELEVENTH CENTURY (FROM GARCÍA SÁNCHEZ AND HERNÁNDEZ BERMEJO 1995).

Acacia abysinica Benth., babul acacia
Adenocarpus spp.
Adiantum capillus-veneris L., maiden hair fern
Alcea rosea L., holly hock
Allium cepa L., onion
Allium porrum L., leek
Allium sativum L., garlic
Althaea cannabina L., mallow
Althaea officinalis L., marsh mallow
Amaranthus blitum L., amaranth
Amaranthus graecizans L., amaranth
Anchusa azurea Miller, bugloss
Anthemis sp., chamomile
Arbutus unedo L., strawberry tree
Artemisia absinthium L., wormwood
Asparagus acutifolius L., (wild) asparagus
Asparagus albus L., asparagus
Asparagus officinalis L., common asparagus
Atriplex hortensis L., orach
Balsamodendron spp., balsam tree
Beta vulgaris L. var. *cicla* L., beet
Boswellia sp., incense tree, frankincense
Brassica napus L., rape
Brassica nigra (L.) Koch, black mustard
Brassica oleracea var. *acephala.,* DC., kale
Brassica oleracea var. *botritys,* broccoli
Brassica oleracea L. var. *capitata* L., cabbage
Calystegia sepium (L.) R.Br., bindweed
Capparis ovata L., bush
Capparis spinosa L., caper bush
Carthamus sp. (*C. arborescens*?, *C. lanatus*?), safflower
Carthamus tinctorius L., safflower
Carum carvi L., caraway
Cassia fistula L., golden-shower
Castanea sativa Miller, chestnut
Celtis australis L., hackberry
Ceratonia siliqua L., carob tree
Chamaemelum sp., chamomile
Chamomilla recutita (L.) Ranschert, chamomile
Chelidonium majus L., celandine
Cicer arietinum L., chick pea
Cichorium intybus L., common chicory
Citrullus colocynthis (L.) Schrader, bitter apple, colocynth
Citrullus vulgaris Schrader, water melon
Citrus aurantium L., orange
Citrus limon (L.) Burm. fil., lemon
Citrus medica L., citron
Commiphora abyssinica (Berg.) Engl., myrrh
Convolvulus arvensis L., field bindweed
Convolvulus althaeoides L., bindweed

TABLE 1. CONTINUED.

Convolvolus tricolor L., dwarf morning-glory
Coriandrum sativum L., coriander
Corylus avellana L., hazelnut
Crocus sativus L., saffron
Cuminum ocyminum L., cumin
Cucumis flexuosus L., snake melon
Cucumis melo L., melon
Cucumis sativus L., cucumber
Cupressus sempervirens L., cypress
Cydonia oblonga Miller, common quince
Cymbopogon schoenanthus (L.) Spr., (oil) grass
Cynara cardunculus L., cardoon
Cynara scolymus L., artichoke
Cyperus rotundus L., coco grass, nut grass
Cyperus esculentus L., nut sedge
Cytisus spp., dyer's broom
Daucus carota L., carrot
Dipsacus fullonum L., wild teasel
Dolichos lablab L., hyacinth bean
Dolichos melanophtalmos DC., asparagus bean
Elaeagnus angustifolia L., oleaster
Erysimum cheiri (L.) Crantz., wall-flower
Ficus carica L., fig tree
Ficus sycomorus L., sycamore
Fraxinus angustifolia Vahl., ash
Fraxinus excelsior L., European ash
Fraxinus ornus L., flowering ash
Genista spp., broom
Gossypium arboreum L., tree cotton
Gossypium herbaceum L., levant cotton
Hordeum vulgare L., barley
Hyphaene thebiaca Mart., gingerbread palm
Jasminum officinale L., jasmine
Juglans regia L., walnut
Juncus sp., rush
Lactuca sativa L., lettuce
Lagenaria siceraria (Mol.) Stand., bottle gourd
Lathyrus sp., wild peas
Laurus nobilis L., laurel
Lawsonia inermis L., henna
Lens culinaris Medic., lentil
Lepidium sp., pepper grass
Ligustrum vulgare L., common privet
Lilium candidum L., madonna lily
Linus usitatissimum L., flax
Lupinus albus L., white lupine
Lycium spp., box thorn
Lygeum spartum L., feather grass, rush
Malus domestica Borkh., common apple
Matricaria sp., matricary
Matthiola incana (L.) R.Br., stock
Melia acederach L., paradise tree
Melilotus officinalis (L.) Pall., yellow sweet clover
Melissa officinalis L., common balm
Mentha suaveolens Ehrh., apple mint

TABLE 1. CONTINUED.

Morus alba L., white mulberry
Morus nigra L., black mulberry
Myrtus communis L., myrtle
Narcissus spp., daffodil
Narcissus papyraceus Ker-Gawler, daffodil
Narcissus pseudonarcissus L., daffodil
Narcissus tazetta L., daffodil
Nasturtium vulgare R. Brown., watercress
Nerium oleander L., oleander
Nigella sativa L., black cumin
Ocymum basilicum L., common basil
Olea europaea L., olive tree
Onopordum sp., thistle
Origanum majorana L., sweet marjoram
Oryza sativa L., rice
Panicum spp., panic grass
Panicum miliaceum L., broomcorn
Papaver sp. (probl. *P. rhoeas* L.), poppy
Papaver somniferum L., opium poppy
Pastinaca sativa L., parsnip
Pennisetum spp., millet
Phoenix dactylifera L., date palm
Phragmites communis Trin., reed
Pimpinella anisum L., common anise
Pinus spp., pine tree
Piper nigrum L., black pepper
Pistacia terebinthus L., cyprus-turpentine
Pistacia vera L., pistachio tree
Pisum sativum L., garden pea
Populus alba L., white poplar
Populus nigra L., black poplar
Portulaca oleracea L., purslane
Prunus armeniaca L., apricot tree
Prunus avium L., sweet cherry tree
Prunus domestica L., plum tree
Prunus dulcis (Miller) D.A. Webb, almond tree
Prunus mahaleb L., mahaleb
Prunus persica (L.) Batsch, peach tree
Punica granatum L., pomegranate tree
Pyrus communis L., pear tree
Quercus rotundifolia Lam., oak tree
Raphanus sativus L., radish
Retama sphaerocarpa (L.) Boiss., broom
Rosa spp., rose
Rubia tinctorum L., madder
Rubus spp., bramble
Rumex spp., dock
Ruta spp., rue
Salix spp., willow
Salix alba L., white willow
Salix babylonica L., weeping willow
Salix purpurea L., basket willow
Scirpus holoschoenus L., soft rush
Sesamum indicum L., sesame
Setaria italica (L.) Beauvois, foxtail millet

TABLE 1. CONTINUED.

Sinapis alba L., white mustard
Solanum melongena L., egg-plant, aubergine
Sorghum bicolor (L.) Moench, sorghum
Spinacia oleracea L., spinach
Stipa tenacissima L., esparto
Styrax benzoin Dryand., snowbell
Styrax officinale L., snowbell
Terminalia sp., myrobalan
Thymus mastichina (L.) L., thyme
Triticum spp., wheat
Ulmus spp., elm
Ulmus minor Miller, elm
Urginea maritima (L.) Baker, sea onion
Verbascum spp., mullein
Vicia sp., vetch
Vicia ervilia (L.) Willd., bitter vetch
Vicia faba L., broad bean
Vigna unguiculata (L.) Walpers., cowpea
Viola tricolor L., European wild pansy
Vitis vinifera L., wine grape
Ziziphus lotus (L.) Lam., jujube

TABLE 2. DATES OF FIRST REFERENCES TO SOME PRINCIPAL AGRICULTURAL SPECIES INTRODUCED INTO THE IBERIAN PENINSULA FROM SEVENTH TO FOURTEENTH CENTURIES.

Species	Century
Cannabis sativa L.	10th
Carthamus tinctorius L.	11th
Citrus aurantiifolia (Christm. et Panz.) Sw.	14th
Citrus aurantium L.	11th
Citrus grandis (L.) Osbeck	11th
Citrus limon (L.) Burn. fil.	10th
Citrus medica L.	7th (before?)*
Crocus sativus L.	10th (7th?)*
Glycyrrhiza glabra L.	7th
Gossypium arboreum L.	13th
Gossypium herbaceum L.	10th
Indigofera tinctoria Lam.	11th
Lawsonia inermis L.	10th
Musa spp. L.	10th (7th?)
Oryza sativa L.	10th
Saccharum officinarum L.	10th (7th?)
Solanum melongena L.	10th
Sorghum spp.	11th
Spinacia oleracea L.	11th

* The question marks indicate a possible previous introduction (because they are mentioned by Isidorus of Seville in his Etymologies).

edge, then the writings of the Andalusi agronomists attest clearly to the existence of such a tradition. It is probable that a very significant component of the popular knowledge that was transmitted from Spain to America in the sixteenth and seventeenth centuries and that is still conserved on both continents mainly come from that ancient heritage gathered, processed and augmented during the history of al-Andalus.

Plants and the Andalusi Cosmic Vision

Did the Andalusi culture have tree species that played a role similar to these in the cosmic vision of many indigenous cultures? Did any sacred tree or species exist around which a cosmology for the Hispano-Arabic civilization could be established? Indeed it is risky to give specific answers, but we can remember that the date palm (*Phoenix datylifera*) is the tree that best defines the Arabic civilization. The role of this species and especially its fruits as food for the nomadic and sedentary peoples from Western Africa to the Orient is reflected by the rich terminology conserved in the Arabic language: each morphological element of the palm is named by one or more terms. Each stage of the maturation and germination of dates has specific names (Löw 1967). This tree is frequently cited in the Koran as a gift of Providence to mankind because it also provides other highly valued resources for food, pottery and industry. Palm groves have always been centers of sedentism and civilization in the desert. The cover and shade of the palm create favorable conditions for the development of animal and plant life (Fillion 1884; Viré 1993).

Up to what point was this obsession and dependence taken to the territories of al-Andalus? Although the palm did not play the same significant role as in the deserts of Northern Africa and the Near East, its presence in poetry and in the Andalusi gardens has been an unquestionable fact since the Cordovan Caliphate in the tenth century.

Other trees also played a major role in the Hispano-Arabic landscape and culture: the autochthonous cork and evergreen oaks (*Quercus suber, Q. ilex, Q. rotundifolia*) dominated the countryside, fed men and cattle, marked the different seasons, heated ovens and hearths, and produced material for farming implements, tools and furnishings. The olive tree (*Olea europea*), fig (*Ficus carica*), pomegranate (*Punica granatum*), hackberry (*Celtis australis*) and mulberries (*Morus* spp.) provided food, handcrafts, habits and ways of living. In short, all these species were characteristic of the cultures and ecosystems at that time.

Medicinal Plants

One of the most influential accomplishments of the Andalusi Agronomic School was the translation from the Greek into Arabic of the *Treatise on Medical Issues* by Dioscorides in Cordova during the tenth century. Most of these agronomists were also physicians (Ibn Waffid, al-Tignari) and Dioscorides work became an essential instrument for them.

To a certain extent the Andalusi agricultural treatises were influenced by the humoral medical theory by Galen and Hippocrates which was applied to the classification of soils, water, fertilizers and plants. References to the properties of the species studied are frequent: the quince is considered to be antidepressive; lentil "fattens the blood," in relation to its high content of iron; oil from safflower seeds has medical applications (not specified); aphrodisiac properties can be found in turnip, wild leek and chamomile oil; the colocynth is used as a laxative; chestnuts have vermifuge properties, like chickpeas (which also facilitate menstruation) and the juice from the leaves of the apricot tree; the carob bean is a diuretic; the leaves and the skin of the lemon are used as antidotes against certain poisons, as is anise.

Not only the curative properties are mentioned by the agronomists. Some plants also prevent organic irregularities derived from the frequent ingestion of others (for example, sleep difficulties and visual problems caused by the broad bean). They even describe methods by which they introduce (generally through incisions) certain drugs into the plants in order to promote properties of the introduced substances in the treated plant.

Obviously, the dietetic and therapeutic qualities of the wild and cultivated species described by the Andalusi agronomists must be understood within the context of medieval medicine. Some concepts found in these references may be completely forgotten today. After careful and critical reading, we might discover the existence of current uses of previously unknown origin or rediscover certain applications that might be reintroduced today.

Knowledge and Management of Wild Species

Despite the great interest in crops, the wild species are not forgotten, either for being exploited directly from their natural populations or for their properties and applications. Thus amongst the cultivated species, fruits of different species such as *Rhamnus* spp., *Rubus* spp., *Arbutus unedo, Myrtus communis, Crataegus monogyna, Sorbus* spp. are collected as well as the wood of *Salix* spp. and *Populus* spp.. Amongst the wild species, oleander (*Nerium oleander*) is used against nits, lice and other parasites on the hair; myrtle (*Myrtus communis*) is collected because of its application for cosmetics (to blacken and strengthen the hair); sea onion (*Urginea maritima*) is used against mice; cords are made from the leaves of the date palm; plants such as rocket (*Eruca sativa*), peppergrass (*Lepidium* sp.) or alexanders (*Smyrnium olosatrum*) have stimulant properties, etc. The catalogue is huge and still to be compiled.

Conclusions: Perspectives of the Ethnobotanical and Philological Research in the Hispano-Arabic Authors

Much research is still needed concerning the agriculture of al-Andalus, the exploitation and conservation techniques, the cultivated species as well as those directly used from the wild, among other topics. This is not only a cultural heritage from the past, but also crucial information to understand the history and evolution of the human/plant relationship and to recover useful species and knowledge for mankind.

The interest in this subject has been renewed after having been ignored by historians and Arabists for a long time. As a consequence, a variety of projects has been initiated. The first phase (already in progress) is philological because these texts require rigorous revision and translation. The identification and interpretation of the names of the plants cited in the texts are especially difficult because, in addition to the strictly philological problems, inconsistencies and mistakes between scientific and common names may also appear. These concerns led to the formation in the late 1980s of a multidisciplinary team formed by Arabists, agronomists and botanists. This team continues to carry out a series of projects, integrated in the national and regional research programs, that will lead to a better knowledge of the agriculture in al-Andalus.

Without any doubt, the Hispano-Arabic agriculture of the eleventh-thirteenth centuries was the most important of the Muslim world. It compiled the previous agricultural knowledge and introduced many innovations, leaving its mark on the agricultural practices of the Christian world. All that Hispano-Arabic agricultural tradition crossed the Atlantic Ocean and was introduced in the New World by the first European colonists, where it mixed with the indigenous knowledge and with other influences imported from other continents.

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The Study of Byzantine Gardens: Some Questions and Observations from a Garden Historian

Joachim Wolschke-Bulmahn

The Study of Byzantine Gardens at Dumbarton Oaks

This book is the end result of initiatives of a group of scholars affiliated with Dumbarton Oaks that date back to the early 1980s, a time when the collaboration of scholars interested in Byzantine studies and their colleagues interested in the history of gardens was not in evidence. It was a time in the evolution of Dumbarton Oaks when its director, Giles Constable, pointed out with regret that there had never been a symposium combining the three disciplines of Byzantine, Pre-Columbian, and garden studies: "The diversity of the three fields of study at Dumbarton Oaks, which resist even the hardiest efforts to build bridges between them, creates tensions between both groups and individuals which will probably never entirely go away."[1] Yet it was also a time of transition. During the following years the situation changed slowly and the intellectual climate at Dumbarton Oaks became more and more conducive to building bridges and to starting discussion of topics of mutual interest among the departments. Of course, due to the specific character and interests of each of the three programs, there have been only limited possibilities for collaboration, but garden studies is one of them, and a fascinating one. In 1984 plans for a colloquium on Byzantine gardens were discussed by the Byzantine scholars Robert Browning, Antony Littlewood,

I would like to thank the many scholars who have discussed issues of Byzantine garden culture with me, beginning with my time as a fellow at Dumbarton Oaks in 1989–90, especially Robert Browning, Anthony Cutler, Alexander Kazhdan, and Henry Maguire, who were among the first to provide me with bibliographic guidance toward the scant resources that exist on the topic. Anthony Cutler's encouragement to pursue my interest and numerous stimulating discussions with him helped me formulate questions on Byzantine garden culture, many of which are reflected in this essay. Linda Safran's discussion of a paper that I presented at the 1991 Dumbarton Oaks roundtable on Byzantine gardens, jointly organized by the programs of Byzantine Studies and Studies in Landscape Architecture, as well as her editorial expertise on this work, were of great help to me as a "non-Byzantinist" exploring this fascinating topic. I also would like to thank the anonymous reader of an earlier version of my introductory remarks for his or her comments. I am grateful to Antony Littlewood for his careful reading of this essay and for his significant suggestions and corrections.

[1] G. Constable, "From the Director," in *Dumbarton Oaks, July 1, 1981–June 30, 1983* (Washington, D.C., n.d.), 15.

and Henry Maguire, with Elisabeth Blair MacDougall, then director of Studies in Landscape Architecture.[2] These efforts did not bear immediate fruit, but were taken up again some years later.

One outcome was a roundtable, "Gardens and Garden Culture in Byzantium," held in the fall of 1991, the first scholarly event in the history of Dumbarton Oaks to join two of its fields of study. It was organized by Henry Maguire, then director of Byzantine Studies, and myself as acting director of Studies in Landscape Architecture. On the one hand, the papers presented at this roundtable and its subsequent discussion could only hope to raise some valuable questions and elucidate once again how little is known about Byzantine gardens. On the other hand, they helped stimulate interest in the topic among a broader group of scholars. In 1994 Antony Littlewood suggested a follow-up event on Byzantine gardens. His suggestion resulted in the colloquium held in November 1996 "Byzantine Garden Culture," which brought together a group of garden historians and scholars who are experts in Byzantine studies, with varying interests and expertise, some of them focusing their research on Byzantine garden culture for the first time. The title of the colloquium, "Byzantine Garden Culture," already indicated that the focus was not exclusively on gardens, but that the speakers approached the topic more broadly, investigating issues related to horticulture and gardening as well as the actual design of gardens in Byzantium and how they were reflected in the arts, literature, and other spheres of Byzantine life.

Garden History as a Scholarly Discipline

Dealing with Byzantium and the Byzantine period may be of interest for garden historians. Garden historical studies deal with a unique subject that distinguishes it from the study of more static art and architecture. Gardens as works of art are different from other art objects. They are in a permanent process of change, development, and perhaps even decay due to their most important component: the plants. The garden's vulnerability, its transience, sets it apart from architecture. It also creates particular problems for research. Gardens are exposed to human use. The interests of humans in gardens change over time; accordingly the design and layout of gardens often vary with changes in taste. Garden historians and archaeologists often have to decipher the various layers of a garden that have been changed over the centuries. Gardens occupy a liminal space, a locus of tension between the practical and the pleasurable, between horticulture and the reality of food production, economy, art, and the ideology of cultural symbolism. Garden historical studies today try to address this broad range of issues. Traditionally there has been a focus on the study of gardens and parks of the elite as works of art in various cultures and societies. This scholarly tradition is also reflected in Byzantine studies. The Aretai Palace and its garden,[3] or automata as art objects and features of palaces and gardens,[4] are representative of this important aspect of Byzan-

[2] For more detail, see A. R. Littlewood, "The Scholarship of Byzantine Gardens," in this volume, 13–21.

[3] See, e.g., H. Maguire, "A Description of the Aretai Palace and Its Garden," *Journal of Garden History* 10 (1990): 209–13.

[4] See, e.g., G. Brett, "The Automata in the Byzantine 'Throne of Solomon,'" *Speculum* 29 (1954): 477–87.

tine garden studies. Gardens and garden culture of the common people are a more recent interest in the field of garden history.

The range of issues related to historic gardens in general, and Byzantine garden culture in particular, cannot be investigated by a single scholarly discipline. Garden history requires, perhaps more than many other disciplines, a broad interdisciplinary approach. Scholars today look for evidence of gardens in literary sources, for example, in the Byzantine romances and in hagiographic, legal, and other texts. Each of these groups of texts has to be read and interpreted in slightly different ways, which requires expertise in Byzantine history as well as in the specialized subdiscipline. Archaeological expertise is as important as knowledge about art history. Botany, the social sciences, and philosophy also contribute to a better understanding of gardens and garden culture in historical societies.

The forming of a discipline of garden historical studies itself was a phenomenon of the nineteenth century, especially in its second half. It was connected to processes of professionalization from horticulture, landscape gardening, and garden art into landscape architecture. A milestone in the process of forming a profession of landscape architecture was the establishment of the American Society of Landscape Architects (ASLA) in 1899. Colleges for horticulture and landscape gardening were established, and the history of gardens gained new importance as part of the curriculum. In Germany the first horticultural college was established in 1823, the Königliche Gärtner-Lehranstalt zu Schöneberg und Potsdam.[5] Over the course of the following 150 years the discipline of garden-historical studies slowly evolved. Today not only garden historians, art historians, and landscape architects are involved, but also social scientists, anthropologists, geographers, and scholars from other disciplines as well. Garden history is a rather new scholarly discipline, still in the process of defining itself and shaping its subject, goals, approaches, and methods. A recent example of the broadening of the subject of garden historical study is the renaming of the *Journal of Garden History,* founded and edited by John Dixon Hunt, as *Studies in the History of Gardens and Designed Landscapes* in 1998.

However, the interest in the history of gardens is not limited to the nineteenth and twentieth centuries. Already during the sixteenth and following centuries intellectuals were interested in the history of gardens. A major step in the evolution of related interests can be traced back to the Renaissance, when a systematic analysis of ancient history aided the development of such disciplines as architecture, medicine, natural science, and engineering. Intellectuals interested in horticulture and gardens also discussed antiquity in its relevance for present and future developments. David Coffin, in his *Gardens and Gardening in Papal Rome,* addresses a special problem with gardens as compared to, for example, Renaissance sculpture and painting, which were guided by ancient models:

> In contrast [to Renaissance sculpture and painting], gardening because of its ephemerality had no physical remains from classical antiquity to aid in any desire to classicize the garden. Even the ancient painted depictions of Roman gardens uncovered later

[5] Cf. H. J. Wefeld, "Peter Joseph Lenné und die erste Gärtnerschule," in F. von Buttlar, ed., *Peter Joseph Lenné: Volkspark und Arkadien* (Berlin, 1989), 91 ff.

> at Pompeii or the House of Livia at Prima Porta were unknown to the Renaissance. The only evidence regarding ancient gardens available to the period was the literary references to gardens in classical poetry, the agricultural writings of the *Res Rusticae Scriptores* [*sic*], or the letters of Pliny the Younger, and of these only Pliny preserved a detailed image of an ancient Roman garden. . . . The limited information regarding ancient gardening may partly explain the lateness of the appearance of what might be defined as a Renaissance garden based on classical thought, and the persistence of the medieval hortus conclusus as seen previously in the garden of Pope Paul III in the Vatican.[6]

Richard Bradley's 1725 treatise, *A Survey of the Ancient Husbandry and Gardening, collected from Cato, Varro, Columella, Virgil and others the most eminent Writers among the Greeks and Romans,* may serve as an example for the interest of seventeenth- and eighteenth-century scholarship in ancient horticulture, botany, and gardening. The life and work of the English virtuoso and writer John Evelyn (1620–1706) also gives evidence of this interest. His unpublished manuscript "Elysium Britannicum" included a chapter titled "Of the most famous Gardens in the World, Ancient and Modern."[7]

Since then there has been an increasing interest in the history of gardens. Over the course of the eighteenth and nineteenth centuries one can find historical overviews in various publications, for instance, in Christian Cajus Laurentz Hirschfeld's *Theorie der Gartenkunst*.[8] A milestone in establishing garden historical studies was John Claudius Loudon's *Encyclopaedia of Gardening,* first published in 1822. Loudon's work includes a substantial "General history of gardening in all countries," which became part of the subtitle of Loudon's *Encyclopaedia.* Book One, entitled "History of gardening among ancient and modern nations," includes a "Chronological history of gardening, from the time of the Roman kings, in the sixth century B.C., to the decline and fall of the Empire in the fifth century of our era,"[9] and a "Chronological history of gardening in continental Europe, from the time of the Romans to the present day, or from A.D. 500 to A.D. 1850."[10] Loudon discusses ancient Greek and Roman garden culture and subsequent developments in Italy. The Middle Ages in general, and particularly Byzantium, are hardly mentioned. This reflects the focus on ancient history, originating in the Renaissance. Loudon's historical treatise was followed by numerous late-nineteenth-century publications on garden design and garden art that in-

[6] D. R. Coffin, *Gardens and Gardening in Papal Rome* (Princeton, N.J., 1991), 58.

[7] Cf. J. Ingram, "John Evelyn's 'Elysium Britannicum': Provenance, Condition, Transcription," in T. O'Malley and J. Wolschke-Bulmahn, eds., *John Evelyn's "Elysium Britannicum" and European Gardening,* Dumbarton Oaks Colloquium on the History of Landscape Architecture 17 (Washington, D.C., 1998), fig. 11, p. 47. This chapter on ancient gardens has apparently been lost. At least, it is not among the hundreds of pages of the manuscript that are housed today in the British Library in London. The significance of ancient writers for Evelyn and his contemporaries has been discussed, for example, by J. Levine, "John Evelyn: Between the Ancients and the Moderns," ibid., 57–78.

[8] Leipzig, 1779–85, 5 vols.

[9] J. C. Loudon, *Encyclopaedia of Gardening* (London, 1850), 13–24.

[10] Ibid., 25–235.

cluded chapters on garden history. In Germany, Eduard Petzold contributed to this discussion with *Die Landschaftsgärtnerei* (1862),[11] as did Gustav Meyer with *Lehrbuch der schönen Gartenkunst* (1862).[12] Another history of gardens written by a German was Bernhard Oswin Hüttig's *Geschichte des Gartenbaus,* which appeared in 1879.[13]

In 1888 Hermann Jäger published his *Gartenkunst und Gärten sonst und jetzt: Handbuch für Gärtner, Architekten und Liebhaber.* Jäger's work is noteworthy because it was one of the first German publications to address specifically issues of Byzantine gardens (Jäger used the term "oströmisches Reich" for the Byzantine Empire). Jäger elaborated on the lack of knowledge about the actual design of the gardens of, for example, Constantine VII and Justinian II and offered the following general description of the "Philopation":

> At the time of the Crusades there existed in Byzantium a famous public garden called Thilopation [Philopation]. Almost each day the court and its attendants appeared there to be admired by the people. There were flowers and quiet bushes, alleys for driving and riding and walkways, pavilions for delight [Lustgebäude] and colorful tents, and pleasures and entertainment of all kinds. Even a game park existed with all sorts of animals, and in secure pits they kept wild animals. In this garden one also could find flowing water, fountains, and ponds with exotic aquatic birds. All this may be true, but one cannot learn from the given information what the garden really looked like. But we surely can assume that symmetry was predominating.[14]

It is regrettable that we do not know on which sources Jäger's remarks on Byzantine garden art were based.

In 1914 Marie Luise Gothein published her *Geschichte der Gartenkunst,* an impressive work and one of the first to include a substantial chapter in its own right on Byzantine gardens. Gothein stated, "Unfortunately the accounts in literature are not yet confirmed by excavations, and the information about gardens is very scanty. The picture which we have shows what is found in all Byzantine civilization—a combination of Graeco-Roman and Asiatic elements."[15] In the decades following Gothein's *History of Garden Art* there was little work on Byzantine gardens, and, as far as I know, there were no specific contributions by garden historians to the topic. Several reasons might explain this absence of garden historical efforts in this field. One is that garden historians, at least in Germany, mainly focused their studies on western traditions beginning with the Renaissance. One exception, Dieter Hennebo in his 1987 work *Gärten des Mittelalters,* touched on Byzantine gardens in a general

[11] E. Petzold, *Die Landschaftsgärtnerei. Ein Handbuch für Gärtner, Architekten, Gutsbesitzer und freunde der Gartenkunst: Mit Zugrundelegung Repton'scher Prinzipien* (Leipzig, 1862).

[12] G. Meyer, *Lehrbuch der schönen Gartenkunst: Mit besonderer Rücksicht auf die praktische Ausführung von Gärten und Parkanlagen* (Berlin, 1862).

[13] O. Hüttig, *Geschichte des Gartenbaus* (Berlin, 1879).

[14] H. Jäger, *Gartenkunst und Gärten sonst und jetzt: Handbuch für Gärtner, Architekten und Liebhaber* (Berlin, 1888), 74.

[15] M. L. Gothein, *A History of Garden Art,* vol. 1 (Jena, 1914), 139.

way, without offering new information.[16] In addition, there existed and still exist considerable difficulties for garden historians regarding language and accessibility of sources needed to study Byzantine garden culture. Moreover, scholars in the field of Byzantine studies approached this topic only occasionally (see Antony Littlewood, "The Scholarship of Byzantine Gardens," in this volume). The entry "Garden" in the *Oxford Dictionary of Byzantium* may not be emblematic for the still enormous gaps in our knowledge about Byzantine gardens, but may indicate how little the publications on Byzantine gardens have made their way into mainstream Byzantine scholarship.[17]

Questions regarding the Study of Byzantine Gardens

Why is it of particular interest now for garden historians, and for scholars of Byzantine history as well, to approach a period where scholars have discovered only a few pieces of evidence about garden-related issues? What may garden historians contribute to our knowledge about this facet of Byzantine culture? Byzantium provides a connection among such different cultures and periods as ancient Greece and Rome, Persia, and the world of Islam. With regard to Rome, thanks to the work of Wilhelmina Jashemski and other scholars, we have considerable information about the layout and design of gardens of various groups within Roman society.[18] Regarding ancient Greek gardens, the state of research is, as with Byzantine gardens, far more fragmentary in character. Studies by Massimo Venturi Ferriolo, Robin Osborne, and Maureen Carroll-Spillecke serve as good examples of scholarship on Greek gardens.[19]

Because the Byzantine Empire bridges late antiquity and the Renaissance, knowledge

[16] Hennebo (*Gärten des Mittelalters* [Munich-Zurich, 1987]) stated in a misleading way, "Der Wasserreichtum byzantinischer Gärten und arabischer Burgen war bekannt. Kein byzantinischer Garten ist ohne Wasserbecken oder Kanal, und es gibt kaum einen maurischen Gartenhof ohne Wasser, dessen klarer Spiegel zu Meditationen einlädt" (p. 119). The garden descriptions in Byzantine romances are apparently taken as realistic literary depictions of gardens: "Die Wasseranlagen, die in den byzantinischen Romanen beschrieben werden, sind von kaum zu überbietendem Prunk und Raffinement. Man täuschte durch die Marmorierung des Bassins bewegtes Wasser vor und stattete die Brunnen mit Wasserautomaten aus, die sich bewegten und Töne von sich gaben. Man verstärkte durch Parfüm die Illusion eines stets duftenden Gartens und vergrößerte seinen Raum durch raffiniert angebrachte Spiegel. . . . Als weiteres Beispiel mag hier der Brunnen dienen, der von Eumathius Makrembolites in der Geschichte von 'Hysmine und Hysminias' (zweite Hälfte des zwölften Jahrhunderts) geschildert wird" (ibid., 122).

[17] J. W. Nesbitt and A. Kazhdan, *ODB* 2:822.

[18] W. F. Jashemski, *The Gardens of Pompeii, Herculaneum and the Villas Destroyed by Vesuvius* (New Rochelle, N.Y., 1979); E. B. MacDougall and W. F. Jashemski, eds., *Ancient Roman Gardens,* Dumbarton Oaks Colloquium on the History of Landscape Architecture 7 (Washington, D.C., 1981); E. B. MacDougall, ed., *Ancient Roman Villa Gardens,* Dumbarton Oaks Colloquium on the History of Landscape Architecture 10 (Washington, D.C., 1987); W. F. Jashemski, *The Gardens of Pompeii, Herculaneum and the Villas Destroyed by Vesuvius,* vol. 2, Appendices (New Rochelle, N.Y., 1993).

[19] M. Venturi Ferriolo, "Homer's Garden," *Journal of Garden History* 9 (1989): 86–94; M. Carroll-Spillecke, *Kepos: Der antike griechische Garten,* Deutsches Archäologisches Institut, Architekturreferat, Wohnen in der klassischen Polis 3 (Munich, 1989); R. Osborne, "Classical Greek Gardens: Between Farm and Paradise," in J. D. Hunt, ed., *Garden History: Issues, Approaches, Methods,* Dumbarton Oaks Colloquium on the History of Landscape Architecture 13 (Washington, D.C., 1992), 373–92.

about Byzantine culture is crucial for understanding western civilization. It is therefore to be expected that some explication of Byzantine horticulture, gardening, and garden design could lead to a better understanding of the evolution of gardens and horticulture in Europe. Perhaps the many entries in lexika about classical history on horticulture, botany, and gardens can broaden our knowledge of Byzantine gardens and how related ideas and expertise permeated from late antiquity to the Byzantine period.[20] What can we learn about Byzantine horticulture and botany by studying scholarship on Greek medicine, botany, and horticulture, for example, in Wilhelm Capelle's 1954 "Der Garten des Theophrast?"[21]

A systematic study of Byzantine traditions might aid the scholarly development of garden history precisely because of the lack of information about Byzantine gardens, the lack of archaeological evidence, of plans and realistic depictions of gardens, or of trustworthy literary descriptions. On the one hand this lack of information is a reason to lament, but it also offers an interesting opportunity for garden history. Too often garden historians have looked first, and sometimes only, at gardens, at the physical object itself, its archaeological remains, plans, maps, and depictions of gardens. Obviously this is important, but it might result in an overly narrow understanding of garden culture in a given society. Too often garden historians have tended to ignore and overlook other important evidence necessary to understand the role of gardens within a society. In the case of Byzantium, because of the nature of its surviving evidence, we have to look systematically into other spheres of Byzantine society and culture. For example, works of art and literary sources, including legal, religious, and literary texts, are critical to find hidden traces of garden culture, texts that otherwise would have been ignored by the garden historian. The scholars contributing to this volume have investigated this area of research. Thus for garden history, a hypothetical approach to questions that is based on developments in other, better investigated spheres of Byzantine life may provide a paradigm for developing better ideas about the theory of gardens and for strengthening the theoretical foundation of garden history as a scholarly discipline in general.

The Question of Continuity and Discontinuity in Byzantine Garden Culture

It might therefore be helpful to apply to gardens hypotheses that have been developed for other spheres of Byzantine life. For example, one issue that is not new to the field of Byzantine studies but has not yet been discussed with regard to gardens in Byzantium is that of "continuity and discontinuity." Among other investigations of the topic, I refer to Alexander Kazhdan and Anthony Cutler's "Continuity and Discontinuity in Byzantine History."[22] The

[20] See, e.g., the entries for "Garten" in *Reallexikon für Antike und Christentum,* vol. 8 (Stuttgart, 1972), 1048–62; *Lexikon der Alten Welt* (Zurich-Stuttgart, 1965), 1025–27; *Lexikon der christlichen Ikonographie*, vol. 1 (Rome-Freiburg-Basel-Vienna, 1968), 77–82. Evaluation of entries on such terms as botany, flora, gardener, and paradise could be interesting for the study of Byzantine gardens.

[21] Cf. W. Capelle, "Der Garten des Theophrast," in *Festschrift für Friedrich Zucker zum 70. Geburtstag* (Berlin, 1954), 54–82.

[22] A. Kazhdan and A. Cutler, "Continuity and Discontinuity in Byzantine History," *Byzantion* 52 (1982): 429–81.

question of continuity and discontinuity in the design and use of Byzantine gardens should be considered regarding the transition from late antiquity to the early Byzantine period as well as within the epoch of the Byzantine Empire itself. We have evidence that discontinuity was a remarkable phenomenon between late antiquity and the Byzantine period, even if different opinions exist about its extent. Cyril Mango refers to a "dramatic break between the lifestyle of Late Antiquity and that of the Byzantine Middle Ages";[23] Charalampos Bouras mentions a "fundamental break in the evolution of the cities."[24] The *Oxford Dictionary of Byzantium* states about Byzantine cities: "In the 7th c., cities underwent fundamental and permanent transformations as they reduced in size and population; their public works and services came to an end. They generally became ruralized."[25]

Did such changes and developments also have an impact on Byzantine gardens? If yes, how? If Byzantine cities during this time were exposed to such change, if whole cities in some parts of the Byzantine Empire shrank into small towns or were even totally abandoned, then it is to be expected that this development also had an impact on garden culture and the design and use of gardens. A decline of the cities, for example, had to be connected with the decline and decay of gardens owned by the wealthy aristocrats. Not only the clientele that demanded pleasure gardens may be supposed to have decreased, but also the number of people who could design and take care of these gardens, and who produced the wealth that enabled a minority to own and enjoy marvelous pleasure gardens.

Until the sixth century, gardens in all probability remained in the tradition of the Greco-Roman world. Characteristics of Byzantine gardens can perhaps best be found in those periods following the seventh and eighth centuries, for example, the so-called Age of Recovery and Consolidation, a period in which "the 'classic' form of the Byzantine centralized and 'totalitarian' state was established, and ideological and cultural uniformity was superimposed upon society."[26] After the decline of the cities an urban revival took place from about the ninth until the eleventh or twelfth centuries. This development no doubt led to a new demand for pleasure gardens, and it would be unlikely that with regard to the layout and design of these new gardens, the tradition of late antiquity was resumed without any changes. Of course, it is possible that the influence of late antiquity was still noticeable, and it is also probable that during the former period an aristocracy still existed that kept the tradition of pleasure gardens alive. Yet the subsequent urban revival probably allowed new influences to be more easily introduced.

The period between the tenth and twelfth centuries was marked by the transformation of the ruling elite and the rise of new noble families, who kept their wealth and political influence over several generations, surely a situation that could have promoted the rise of new and elaborate pleasure gardens. Would it therefore be worthwhile to study the literary sources of this period in the search for garden historical evidence?

[23] C. Mango, "Daily Life in Byzantium," *JÖB* 31.2 (1981): 338.

[24] C. Bouras, "City and Village: Urban Design and Architecture," *JÖB* 31.2 (1981): 612.

[25] C. Foss and A. Cutler, *ODB,* 1:465; see also Bouras, "City and Village," 612.

[26] A. Kazhdan, *ODB,* 1:346.

Regarding the layout and use of gardens, the shift from pagan to Christian patronage should be explored to determine what its impact was on garden culture. For example, statues of garden-related deities such as Priapus, Hermes, and Pan were a common feature of gardens in late antiquity and not only in the gardens of the nobility. The presence of such deities in gardens may suggest a religious dimension of gardens in late antiquity. An epigram on a statue of Hermes guarding a garden says, "Wayfarer, come not near the vines, nor yet the apples, nor where the medlars grow, but pass me by there along the rope, so as not to disturb or break off any of these things which the gardener Midon got with labour. He it was who set me up here, but if thou give not ear to me, thou shalt know how Hermes rewards wicked men."[27] Mango describes how the statues of pagan divinities were in use over centuries after late antiquity and that a "new 'folkloristic' significance arose in their popular imagination."[28] Or is it to be supposed that statues of pagan deities disappeared gradually over the centuries from the Byzantine garden?

We might also wonder whether one can notice an increasing Islamic influence. From the ninth century until the twelfth century in particular, traces of contact with the Islamic world are perceptible in Byzantine culture.[29] The reign of Emperor Theophilos, for example, is considered by Müller-Wiener as "the epoch of strongest influence on the Byzantine world by Arab culture."[30] In this context he refers to the gorgeous furnishings of the palace, such as the mechanical toys, as well as the extravagant gardens. But was the influence exercised by the Islamic world on the imperial palace in Constantinople also reflected in the gardens of the noble and wealthy people or in the gardens of the common people? Is the example of the palace sufficient to draw inferences about Byzantine gardens in general?

The question of continuity and discontinuity has other ramifications as well. What impact did the "striking differences" between the ancient and the Byzantine family, which have been summarized in their impact on urban life as the change "from ancient 'open' house" to "the medieval 'closed' habitat,"[31] have on garden culture? Did the function of parks, squares, and other public open spaces in this period change in accordance with the change from the public role of the citizen to that of a more private retreat in Byzantine society?[32]

With Christianization, a new type of garden arose, the gardens of the monasteries, which had an enormous impact on western European garden culture.[33] The study of monastic garden culture continues to have considerable gaps, but we know that knowledge concerning horticulture, gardening, and about newly introduced plants was spread by Byzantine monks and nuns, influencing garden culture in Europe and elsewhere over many centuries.

[27] *Anthologia Planudea* 255, in *The Greek Anthology with an English Translation by W. R. Paton,* 5 vols. (Cambridge, Mass., 1960), 5:313.

[28] C. Mango, "Antique Statuary and Its Byzantine Beholder," *DOP* 17 (1963): 59.

[29] Cf. O. Grabar, *ODB,* 2:1019.

[30] W. Müller-Wiener, "Byzanz und die angrenzenden Kulturkreise," *JÖB* 31.2 (1981): 596.

[31] Kazhdan and Cutler, "Continuity and Discontinuity," 463.

[32] Cf. Mango, "Daily Life in Byzantium."

[33] See A.-M. Talbot, "Byzantine Monastic Horticulture: The Textual Evidence," in this volume.

For a systematic study of Byzantine garden culture the list of questions to be addressed can be enlarged. A few more of these questions illustrate the point. Did *the* Byzantine garden ever exist? Or is it to be expected that in an empire with more than a thousand years of history, with a multinational population living in "a variety of climatic and agricultural zones,"[34] there existed at the same time a multitude of different forms of gardens? Did a particular Byzantine garden style evolve from the integration of characteristics of its historic predecessors? What, in the final analysis, was characteristic of Byzantine gardens? Was it the layout of gardens, the use of statuary, the cultivation of specific plants? What elements composed a Byzantine garden? Did the improvement of such horticultural techniques as breeding and pruning give new impulses to garden culture? Did specific garden features exist based on newly invented craftsmen's techniques and newly developed building materials?

The profession of the gardener in Byzantine culture is also worth exploring. Probably this existed as independent and distinguishable from other professions. For this we have some evidence from the later period of Byzantine history. The *Prosopographisches Lexikon der Palaiologenzeit* makes reference to gardeners, even if only a few. Thus there are 11 references to gardeners, but more than 450 to bishops and archbishops, more than 2,500 to landed proprietors, and nearly 60 to prostitutes. Yet we cannot form absolute conclusions concerning reality in Byzantine life from these figures. First of all, they may tell us more about the interests of those who wrote the texts and documents on which the figures are based. Therefore, what position did the gardener hold in Byzantine society? Would the answer to this question tell us something about the significance of gardens and horticulture? There is evidence that artisans and craftsmen held a respectable position in Byzantine society, particularly around the twelfth century—such writers as John Tzetzes, Michael Haploucheir, and Theodore Prodromos discuss the "theme of a poor intellectual's envy of a well-to-do artisan."[35] Did this envy also include the profession of the gardener? Some sources offer information about the gardening profession and its social position. In late antiquity there are implications that a gardener sometimes could gain wealth and reputation, as indicated by an epigram: "To thee, Priapus the gardener, did Potamon, who gained wealth by his calling, dedicate the hoe that dug his thirsty garden."[36] Another epigram tells about a poor gardener who has become rich: "Stephanus was poor and a gardener, but now having got on well and become rich, he has suddenly turned into Philostephanus."[37] Do such references provide enough evidence to ascribe significance to the role of the gardener or more broadly to gardens and horticulture?

The difficulties posed by these questions are enormous for the field of Byzantine garden culture. It is easy to demonstrate how difficult it is for scholars of all disciplines to deal with this topic and to find unequivocal answers to these questions. I ended a 1992

[34] Kazhdan, *ODB,* 1:345.

[35] *ODB,* 2:901.

[36] *Anthologia Palatina* 6.21 (*Greek Anthology*, 1:309).

[37] Nikarchos, in *Anthologia Palatina* 11.17 (*Greek Anthology*, 4:77).

article with the following beautiful description by Nicholas Mesarites of the garden landscape around the church of the Holy Apostles in Constantinople:

> One can also see deep and fertile soil, rich and soft, easy to dig, richly responding to the desires of husbandmen, equally good for sowing and growing, and well suited to the production of both classes of products, both tall trees with rich fruit, and fruits in abundance; the beauty of these even surpasses the quantity, and the crops are taller than trees themselves are elsewhere. One can see saffron growing in the land about this Church, balsam and lilies, fresh clover and hyacinth, the rose and the oleander and everything of sweet aroma. This is more lovely than the garden of Laertes, than the much-sung happy Arabia. For there is a variety of gardens in it and pleasant aqueducts and a multitude of springs, and houses hidden in trees, a scene of every pleasant view, choruses of musical birds, a moderate breeze, sweet scents of spices.[38]

I was given this description by a well-known Byzantine art historian, and I quoted it as an argument that in a culture where the aesthetics of beautiful landscapes played such a role, it would be promising and worthwhile to investigate its gardens in more detail. Some time later Antony Littlewood informed me that this was not truly a contemporary description: "The literary descriptions are largely artistic exercises which give very little precise contemporary information. You quote Mesarites' description of the gardens around the Church of the Holy Apostles in Constantinople, which is our most detailed description; but it is taken word for word (with a few omissions) from Libanios' description of a garden in Antioch. How much, therefore, can we take as factual?"[39] The study of Byzantine garden culture is a fascinating and challenging enterprise. It requires the collaboration of scholars from a variety of disciplines interested in Byzantine history and in the history of gardens. The various contributions in this volume should help to stimulate further research and discussion on this topic.

Universität Hannover

[38] "Nikolaos Mesarites: Description of the Church of the Holy Apostles at Constantinople," ed. and trans. G. Downey, *TAPS,* n.s., 47 (1957): 863, quoted in J. Wolschke-Bulmahn, "Zwischen Kepos und Paradeisos: Fragen zur byzantinischen Gartenkultur," *Das Gartenamt* 41.4 (1992): 228.

[39] A. R. Littlewood, personal communication, 4 May 1992.

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Byzantine Monastic Horticulture: The Textual Evidence

Alice-Mary Talbot

There is a paucity of evidence on Byzantine gardens, both textual and archaeological. When we turn to monastic horticulture, however, the situation is somewhat less bleak, for both foundation documents (typika) and saints' lives shed occasional light on the gardens, vineyards, and orchards that provided food, drink, and eucharistic wine for the use of the resident monks or nuns. The surviving textual sources should ideally be supplemented by the findings of archaeological excavation of actual monastic gardens. Such excavation, which has been carried out to date primarily in the late Roman monasteries of Palestine, can only be touched upon in this essay, in which I focus on the literary evidence. For the most part I limit my observations to those gardens situated in the immediate vicinity of monasteries, rather than to agricultural properties owned by monasteries but located at some distance from the monastic complex.[1]

Monastery Site Selection

Most founders of Byzantine monasteries took care in choosing the site of their monastic complexes: they looked for fertile land, a good water supply, temperate climate, peaceful surroundings, security, and the natural beauty of the landscape. Good climate and pure water were essential for health and horticulture, while isolation and quiet would provide physical security and an environment conducive to contemplation and spiritual progress.[2]

I am grateful to my colleagues Angela Hero, Joseph Patrich, and Svetlana Popović, who provided useful bibliographical citations, and to René Gothóni, Thalia Gouma-Peterson, Yizhar Hirschfeld, and Antony Littlewood, who gave me illustrative materials. Thanks are due also to Yizhar Hirschfeld, Sharon Gerstel, Antony Littlewood, and the anonymous reviewers, who read earlier drafts of this article and made useful comments. Research for this article was greatly facilitated by use of the Dumbarton Oaks Hagiography Database.

[1] There is much information, for instance, on such gardens and fields in Athonite documents; see, for example, J. Lefort, N. Oikonomidès, et al., *Actes d'Iviron,* vol. 4 (Paris, 1995), no. 97, which describes the gardens near Thessalonike leased by the monastery to the Argyropouloi in the early 15th century. C. Constantinides, "Byzantine Gardens and Horticulture in the Late Byzantine Period, 1204–1453: The Secular Sources," in this volume, 88–90, summarizes much of the available data.

[2] I have developed this topic further in a paper on monastery site selection delivered at the Belfast colloquium of September 1998, "Founders and Refounders of Byzantine Monasteries."

Typical is the ideal monastery site described in the Life of St. Luke of Steiris: "See what sort of place this is where you are standing—how temperate in climate, how pleasant, free from all disturbance and isolated from men, and also how well supplied with very pure water, sufficient both for the demands of thirst and for the irrigation of vegetables and plants."[3] In the eleventh century, Christodoulos described as follows a site on the island of Kos that he considered for his new monastic foundation: "an extensive ridge with no habitation, in a well exposed site, well-watered besides and temperate."[4]

An even more striking example of a real appreciation of the landscape setting, for both the view it afforded and its agricultural bounty, is a passage in Isaac Komnenos' twelfth-century typikon for the Kosmosoteira monastery at Pherrai, where he lauds its site, with

> the river Ainos, the sea, with its surf and its calms, the pasturage and grazing land of evergreen meadows to nourish horses and cattle. There is the site on the crest of the hill, with its easy access. There is the fine temperance of the currents of air and the power of strong breezes with the everlasting reeds rustling in tune with them about the mouth of the river. There is the immense plain, and the panoramic[5] view, especially in summertime with wheat in flower and in ear, which impresses great gladness on viewers. There is the grove of lovely saplings growing so near the monastery upon which vines are entwined, while clear and cold water gushes forth, bringing delight to parched throats.[6]

Other monastic founders, on the other hand, selected less well favored sites for their new foundations. Athanasios of Athos, for instance, was motivated by spiritual rather than practical concerns when he picked the location of the Lavra. He chose a spot near the southeastern tip of the holy mountain where he had first lived as a hermit, battled with the devil, and received enlightenment, even though it had an inadequate water supply.[7] The future patriarch Nikephoros I, when he first retired from his civil service career, is said to have intentionally selected an unsuitable site for his monastic foundation on a ridge overlooking the Bosporos. Since he was renouncing the comforts of urban life,[8] he reportedly deliberately sought out a place where it would be an arduous struggle even to grow a few vegetables. His biographer emphasizes that the location was "unlovely because of its harsh

[3] *The Life and Miracles of St. Luke of Steiris,* trans. C. L. and W. R. Connor (Brookline, Mass., 1994), chap. 54 (hereafter *V. Luc. Steir.*).

[4] F. Miklosich and J. Müller, *Acta et diplomata graeca medii aevi sacra et profana,* vol. 6 (Vienna, 1890), 62–63 (hereafter MM); trans. P. Karlin-Hayter, in *Byzantine Monastic Foundation Documents,* ed. J. Thomas and A. C. Hero (Washington, D.C., 2000), 581 (hereafter *Documents*).

[5] Reading εὐτερπής for εὐτρεπής, as suggested by Ph. Koukoules, Βυζαντινῶν βίος καὶ πολιτισμός, vol. 6 (Athens, 1955), 77.

[6] L. Petit, "Typikon du monastère de la Kosmosoteira près d'Aenos (1152)," *IRAIK* 13 (1908): chap. 74, p. 57; slightly modified version of the English translation by Nancy Ševčenko, *Documents,* 833.

[7] *Vitae antiquae duae Sancti Athanasii Athonitae,* ed. J. Noret (Turnhout, 1982), *vita A,* chaps. 57–59; *vita B,* chaps. 21, 25 (hereafter *V. Athan. Ath.*).

[8] *Vita* of Nikephoros, ed. C. de Boor in *Nicephori archiepiscopi Constantinopolitani opuscula historica* (Leipzig, 1880), 147.26–148.9 (hereafter *V. Niceph.*); trans. E. Fisher in *Byzantine Defenders of Images,* ed. A.-M. Talbot (Washington, D.C., 1998), 50–51.

and uneven ground and completely barren for cultivation because of the steepness of the ridge; it was a thirsty <land>, not softened by any water, and unless rain water was brought <to it>, deprived <even> of that by virtue of its precipitous slope."[9] This seems to be a case in which the beauty and fruitfulness of the landscape were considered a negative criterion for a monastic foundation, although Nikephoros soon built irrigation channels to facilitate horticulture. Thus the hagiographer may be seeking to justify Nikephoros' choice of an apparently inappropriate site by stressing the virtuous element inherent in the strenuous effort required to provide well-watered gardens for his monastic complex.

The deliberate choice of monastery sites inappropriate for horticulture is also evident in the lengthy *vita* of Lazaros of Mount Galesion, which emphasizes the lack of water at all three complexes he founded on the holy mountain. The monks had to rely on rainwater from cisterns or water carried up from the river by pack animals, and there was an insufficient supply for irrigating vegetable gardens.[10] Thus the monks were dependent on charitable donations and provisions from a nearby monastery at the foot of the mountain for their food.[11] Lazaros, however, felt the mountain to be ideal for monastic settlement precisely because it was "impassable and craggy and very rugged . . . <and> waterless, and for these reasons was able to offer much tranquillity to the person who went there."[12] In his words: "If you <really> want to be saved, <then> persevere on this barren mountain . . . the fathers <of old> always sought out the deserts and most uncomfortable places, not those which had springs and leafy trees and other physical comfort<s> . . . <as soon as> they began to transport <fertile> soil from elsewhere for growing vegetables and they set up trees and cisterns in front of their doors, <those monks> went into decline and were delivered to destruction."[13]

It may not be a coincidence that Lazaros received his early monastic training at Mar Saba in the Judean desert, where horticulture was also virtually impossible;[14] the monastery

[9] *V. Niceph.*, 148.

[10] *Vita* of Lazaros of Galesion, chaps. 45, 91, 174–76, ed. in *AASS,* Nov. 3:523c, 537b, 561–62 (hereafter *V. Laz. Gal.*).

The aridity of Mount Galesion is also emphasized in an undated chrysobull of Andronikos II (MM, 5:266): "For the place is a steep and rugged mountain, possessing scarcely anything <conducive> to refreshment and physical comfort; for neither is it shaded by trees, nor do any plants or grass grow there, nor does it bear anything else useful <that comes> from the earth, but is completely and totally unsuited for such fruits of the earth, although it is fertile in virtue, both producing it naturally and also receiving seeds and thus conceiving and bearing and nurturing virtue and making it increase manyfold." Part of this passage is also found in the *vita* of St. Meletios the Confessor, ed. S. Lauriotes, "Βίος καὶ πολιτεία καὶ μερικὴ θαυμάτων διήγησις τοῦ ὁσίου πατρὸς ἡμῶν Μελετίου τοῦ Ὁμολογητοῦ," Γρηγόριος ὁ Παλαμᾶς 5 (1921): 613, which adds the detail that the monks had to relieve their thirst by drinking their own sweat!

[11] Cf. chap. 34 of the *V. Laz. Gal.,* which states that the monks got most of their food from donations, but that their beans were provided by a field at the monastery of St. Marina.

[12] *V. Laz. Gal.,* chap. 36, *AASS,* Nov. 3:520e. The English translation here and in following passages is taken from R. Greenfield, *The Life of Lazaros of Mt. Galesion: An Eleventh-Century Pillar Saint* (Washington, D.C., 2000).

[13] *V. Laz. Gal.,* chap. 216, *AASS,* Nov. 3:574b.

[14] Chapter 26 of the Life of John the Hesychast states that "not even in fresh air and a garden do figs or any tree grow, because of the great heat and dryness of the air of the laura . . . and indeed, although many have tried to plant along the gorge, where there is depth of soil, and have watered throughout the winter, the plants

1 Monastery of Choziba, Judean desert (photo: Y. Hirschfeld)

had to rely on vegetables grown in a garden in Jericho and on wheat transported from Transjordan,[15] although the associated hermitages did have small garden plots. Likewise, the desert monastery of Choziba (Fig. 1), where "everything is so blasted by the burning sun

have scarcely been able to hold their own for a year because . . . of the great dryness of the air, and the excessive heat." Cf. E. Schwartz, *Kyrillos von Skythopolis* (Leipzig, 1939), 221; trans. in R. M. Price, *Cyril of Scythopolis: The Lives of the Monks of Palestine* (Kalamazoo, Mich., 1991), 240.

[15] Cf. J. Patrich, *Sabas, Leader of Palestinian Monasticism* (Washington, D.C., 1995), 165; Y. Hirschfeld, "The Importance of Bread in the Diet of Monks in the Judean Desert," *Byzantion* 66 (1996): 144–45, 150.

that one can see the rock emitting tongues of flame" and pools of water were heated by the sun to the boiling point, was primarily supplied from gardens located in more salubrious terrain on the edge of the desert near the oasis of Jericho. These fertile lands are described by a twelfth-century Byzantine pilgrim, John Phokas: "the whole district is well watered and is used for a garden for the monasteries situated in the desert. The ground is parcelled out and shared among the Holy Monasteries. It is all planted with trees and vines and for this reason the monks have set up towers among the monks' allotments, from which they harvest fruit in plenty."[16]

Clearing of the Land for Horticulture

The construction of rural monasteries wrought changes in the Byzantine landscape, whether in Palestine, Anatolia, Greece, or Italy, and whether the chosen site was idyllic or harsh. The impact on the land was relatively small compared to that of agricultural village communities and rural estates; nonetheless, monks often served as "pioneers" in undeveloped areas. With the exception of the most ascetic of hermits (the βοσκοί, or "grazers"), who, living in caves, eating wild plants, and drinking rainwater, made virtually no impact on their environment,[17] almost all hermits and monks were involved to some extent in subduing and transforming their natural surroundings. One of the biographers of Athanasios of Athos seems conscious of this point when he describes the condition of the holy mountain when Athanasios first arrived there: the land was unplowed and unsown; the hermits did not cut furrows in the ground but collected wild fruits from trees for their food; their huts were made of twigs with straw roofs.[18] But when Athanasios began to build the Great Lavra, his first action was to cut down trees in the thick forest and to make level areas in the rough ground.[19] Clearing forest land and burning the slash figure in hagiographic descriptions of the foundation of a number of other monasteries in Italy and Anatolia.[20]

In heavily forested areas, land had to be cleared not only for the construction of churches and cells, but also for planting the gardens, orchards, and vineyards that formed an integral part of most monastic complexes. The biographer of the tenth-century monk Neilos of

[16] J. Wilkinson et al., *Jerusalem Pilgrimage, 1099–1185* (London, 1988), 328–29. Choziba must have had at least a small garden, however, since George of Choziba worked at the monastery as a gardener; see p. 59 and note 72 below.

[17] An example of such a hermit is Paphnoutios, who preceded Lazaros on Mount Galesion; see *V. Laz. Gal.* chap. 39, *AASS,* Nov. 3:521D: "<He took> his food from the plants that grew in front of the cave, and his drink was the water that trickled down from the rock above it and was caught by that below, lying stagnant where it was hollowed out a little." For more on the "grazers," see note 34 below.

[18] *V. Athan. Ath. (A),* chap. 38, p. 19; *V. Athan. Ath. (B),* chap. 13.

[19] *V. Athan. Ath. (B),* chap. 23.21–23. See also chaps. 8–9 and 11 of Athanasios' typikon for the Lavra, ed. P. Meyer, *Die Haupturkunden für die Geschichte der Athosklöster* (Leipzig, 1894), 139.

[20] See, e.g., *vita* of Christopher and Makarios, ed. I. Cozza-Luzi, *Historia et laudes ss. Sabae et Macarii* (Rome, 1893), 83, 87 (hereafter *V. Christoph. et Macar.)*; *vita* of Sabas the Younger, ibid., 15.15–16, 18.2–7; *vita* of Nikephoros of Miletos, ed. T. Wiegand, *Milet 3.1. Der Latmos* (Berlin, 1913), 165.26–32; *vita* of Nikephoros of Sebaze, ed. F. Halkin, "Une victime inconnue de Léon l'Arménien? Saint Nicéphore de Sébazè," *Byzantion* 23 (1953–54): 27.14–16.

2 Terraced gardens at the monastery of St. Paul, Mount Athos (photo: after E. Koutoumanos, *Athos from the Heavens* [Athens, 1994])

Rossano, for example, describes "the monks working on the mountain and rolling <down> the burned trees to make a clearing and transform wood-bearing land into grain-bearing land."[21] Rocks had to be removed from stony soil, garden plots leveled, or terraces constructed (Figs. 2, 3).[22] In more barren areas, fertile soil might have to be transported to build up planting beds. Thus at the Enkleistra of Neophytos on Cyprus a ravine was filled in with earth to make level terrain for a garden.[23]

Water Supply and Irrigation

A good water supply was an essential requirement for horticulture, and on this subject there is abundant archaeological material to supplement the information of saints' lives and typika. Particularly in the area of Byzantine Palestine, systematic excavations and surveys at the lavras, monasteries, and hermitages in the Judean desert have uncovered detailed evidence about the systems of channels, cisterns, and rock pools (Figs. 4, 5) that provided water not only for horticulture but for other activities at the monastery, such as laundry, cooking, grinding grain, watering animals, and bathing. Such provisions for a water supply obviated

[21] G. Giovanelli, Βίος καὶ πολιτεία τοῦ ὁσίου πατρὸς ἡμῶν Νείλου τοῦ Νέου (Grottaferrata, 1972), 87.31–33.

[22] On terracing, see, e.g., Patrich, *Sabas,* 82 and 151.

[23] I. Tsiknopoullos, Κυπριακὰ τυπικά (Leukosia, 1969), chap. 18, p. 88.

3 Terraced gardens at the monastery of Simonopetra, Mount Athos (photo: R. Gothóni)

the necessity to carry water by hand or on donkeyback from a spring, stream, or well.[24] In an arid region such as the Judean desert, elaborate waterworks were necessary to make use of every drop of rainwater to supplement the occasional spring or stream. The monks took advantage of natural depressions in the rock or built numerous cisterns to catch and store

[24] Y. Hirschfeld, *The Judean Desert Monasteries in the Byzantine Period* (New Haven, Conn.-London, 1992), 148–49. Hagiographic tradition relates that John of Damascus, when serving a monk in the Egyptian desert, had to carry water from a long distance in the summertime to irrigate the *xerokepion*. An angel lightened his labors, by helping to carry the water; cf. *vita* of Kosmas the Hymnographer and John of Damascus, ed. A. Papadopoulos-Kerameus, Ἀνάλεκτα Ἱεροσολυμιτικῆς Σταχυολογίας (St. Petersburg, 1897), 283.

4 Cistern at the site of a ruined monastery north of Jericho (photo: Y. Hirschfeld)

the winter rains, which were often channeled from roofs and courtyards by gutters and downspouts. The water could then be channeled to different parts of the monastic complex. Alternatively water might be brought from some distance by aqueducts, often simple dug channels (Fig. 6).[25] At Mar Saba, almost every hermitage had its own cistern, to provide for the hermit's personal needs and for watering his individual garden plot.[26] An additional advantage of the reservoir system was that the silt that accumulated at the bottom of settling tanks furnished fertile soil for the gardens.[27] Saints' lives also mention rain barrels (in this case, pithoi) standing next to gardens, presumably to supply water for irrigation.[28]

As noted above, in the better-watered areas of Greece and Anatolia, monastic founders generally took a good water supply into consideration in the selection of a construction site. Luke the Younger chose a spot "abundant in the purest water" and had only to clear away the brush from the spring to make its flow increase.[29] When, however, founders chose arid locations, it became necessary to transport water from some distance or to devise com-

[25] Hirschfeld, *Desert Monasteries,* 148–61; Patrich, *Sabas,* 54, 61–63, 78, 151. See also E. Damati, "The Irrigation System in the Gardens of the Monastery of St. Martyrius (Ma'ale Adummim)," forthcoming in a supplement to the *Journal of Roman Archaeology.*

[26] Patrich, *Sabas,* 100, 106–7.

[27] Hirschfeld, *Desert Monasteries,* 159.

[28] Synaxarion notice for Gregory of Akritas, in *Synaxarium CP,* 374.11–13.

[29] *V. Luc. Steir.,* chaps. 54–55.

5 Cutting for rainwater storage in the rock outside a hermit's *kellion* above Katounakia on Mount Athos (photo: A. R. Littlewood)

plicated supply channels. The site chosen by the future patriarch Nikephoros, for example, was watered only by rain, which did not soak into the ground but ran off immediately because of the steepness of the slopes. Nikephoros transformed the landscape and "replaced <its> barrenness with a reputation for fruitfulness, <its> aridity with the abundant rains of heaven. <He accomplished this> by enriching <the land> with an abundance of interconnected cisterns branching through the hollow rocks . . . <as a result the spot> imitates faithfully the paradise of God."[30]

Athanasios of Athos, on the other hand, relied not on rainwater cisterns but on water channeled from distant springs, as his *vita* describes in some detail:

> And since there was a lack of abundant water at the site of the Lavra, he devised a way out of his difficulties and showed his great genius and cleverness. For after traversing many parts of Athos to find an abundant source of water and exerting much effort, he found a lofty and inaccessible site, which had water but was more than 70 stades (ca. 8 miles) distant from the Lavra. And he began to dig from that point, and excavating trenches in the steep and high slopes, and placing pipes in the channels, he transported a stream of water to the monastery from different sources.[31]

[30] *V. Niceph.,* 148; trans. Fisher, in Talbot, *Defenders of Images,* 51–52.

[31] *V. Athan. Ath. (B),* chap. 25, p. 152; see also *V. Athan. Ath. (A),* chap. 81, pp. 37–38.

6 Water channel near St. Catherine's monastery, Mount Sinai (photo: after *Aramco World*, March–April 1995, 22)

This water was brought inside the monastery for various purposes, being channeled past the cells. It was also directed to two mills and used to water the fruit trees and irrigate the gardens (κῆποι). Aqueducts were used to supply cisterns at other Athonite monasteries as well, such as Stavroniketa (Fig. 7) and Simonopetra (Fig. 3).[32]

Monastery Horticulture

With some exceptions, planting a garden was an essential aspect of monastic foundation, whether it be a solitary hermitage or an enormous complex housing hundreds of monks. The twelfth-century archbishop of Thessalonike, Eustathios, criticized hermits who withdrew to mountains and, like the Cyclopes, did not plow or plant anything;[33] in fact, however, this lifestyle was characteristic of only a relatively small number of ascetics who survived by foraging for wild herbs, fruits, or nuts[34] or emulated the example of St. Paul the

[32] On Simonopetra, see S. Nomikos, "Water Supply—Irrigation—Water Power," in *Simonopetra: Mount Athos* (Athens, 1991), 88–112. The typikon of Neophytos, in describing the irrigation channels dug to water the garden of the Enkleistra on Cyprus, comments that sometimes a violent downpour would produce too much water, which would bury the garden with sand and stones, requiring much labor for the monks assigned to remove this debris; cf. Tsiknopoullos, Κυπριακὰ τυπικά, chap. 18, p. 88.

[33] Eustathios of Thessalonike, Commentary on the *Odyssey,* 1618.31–34, as noted in A. Kazhdan, "Ὁ τέλειος μοναχὸς ἢ ὁ τέλειος πολεμιστής; ὁ συγκερασμὸς τῶν κοινωνικῶν ἰδανικῶν στὸ Βυζάντιο," *Dodone* 15 (1986): 211.

[34] Hirschfeld (*Desert Monasteries,* 215) provides a good description of the "grazer" hermits of the Judean desert, who subsisted on wild plants such as *melagria* (asphodel), reed hearts, saltbushes, and wild caper buds,

First Hermit, who supplemented his diet of spring water and dates from the ancient palm tree that grew near his cave dwelling with a daily bread ration brought by a crow.[35] In reality, most hermits did tend small garden plots, even St. Antony the Great, that model of the ascetic life. His biographer, Athanasios, tells us that when Antony first withdrew to the desert, he depended upon charitable donations of bread for survival.[36] Later, however, when he moved to the greater solitude of the Upper Thebaid he became more self-sufficient. He settled at the foot of a mountain, where "there was water, crystal-clear, sweet, and very cold. Spreading out from there was flat land and a few scraggy date-palms."[37] In the beginning he accepted bread from his traveling companions and nomadic Arabs, supplementing his diet with dates from the palm trees. Realizing, however, that he was imposing upon others for his bread supply, he decided to raise his own grain. So he asked some visitors

> to bring him a two-pronged hoe, an axe, and some grain. When these were brought, he went over the ground about the mountain, and finding a small patch that was suitable, and with a generous supply of water available from the spring, he tilled and sowed it. This he did every year and it furnished him his bread. He was happy that he should not have to trouble anyone for this. . . . But later, seeing that people were coming to him again, he began to raise a few vegetables too, that the visitor might have a little something to restore him after the weariness of that hard road.[38]

St. Antony's small-scale garden in the Egyptian desert may have resembled the gardens still tended today by Bedouin in the vicinity of St. Catherine's monastery in the Sinai peninsula (Fig. 8).

Archaeological excavation and survey work in the Judean wilderness have uncovered the remains of gardens attached to both hermitages (Fig. 9) and monasteries, identified by terracing or by the waterworks that irrigated them. One of the best examples is the vegetable plot of the hermit Kyriakos, known to us from his *vita* written by Cyril of Skythopolis. Cyril tells us that since the hermitage had no cistern, Kyriakos had made indentations in the

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supplemented by bread and kidney beans brought to them from the outside world. See also Patrich, *Sabas* 8, 42–43.

[35] Life of St. Paul the First Hermit, trans. H. Waddell, *The Desert Fathers* (London, 1936) 31, 35. The hagiographer comments that the palm tree provided Paul with food and clothing, presumably some sort of tunic woven from palm leaves or fibers.

[36] *Vita* of Antony, PG 26:856A, 861B; trans. R. T. Meyer, *St. Athanasius: The Life of Saint Antony* (Westminster, Md., 1950), chaps. 8, 12.

[37] *Vita* of Antony, PG 26:916A; trans. Meyer, *Life of Antony,* chap. 49.

[38] *Vita* of Antony, PG 26:916–17; trans. Meyer, *Life of Antony,* chap. 50; cf. S. P. Bratton, *Christianity, Wilderness and Wildlife: The Original Desert Solitaire* (Scranton, Pa., 1993), chap. 10. For the impression made on a 19th-century visitor to the monastery, located in an oasis, and its gardens, see G. J. Chester, "Notes on the Coptic Dayrs of the Wady Natrûn and on Dayr Antonios in the Eastern Desert," *Archaeological Journal* 30 (1873): 113: "<The monastery's> lofty walls enclose . . . large and beautiful gardens, abounding in vegetables and date palms, olives, carobs and other trees. These are watered by rills conducted from a magnificent spring, which bursting out of a cleft in the rock behind, falls into a round artificial basin hewn in the natural stone, and afterwards into a large covered reservoir. It was of course the existence of this delicious and copious Ain which, in the first instance, determined the position of the Convent. . . . The charm of these beautiful and well-watered gardens in that 'barren and dry land' will be readily imagined."

7 Aqueduct at Stavroniketa monastery, Mount Athos (photo: R. Gothóni)

rocks in which he collected sufficient rainwater during the winter to serve both drinking and irrigation purposes during the summer, specifically for watering his vegetables.[39] In fact, archaeologists found below his cave at Sousakim, a plot measuring ca. 25 m^2, and at a distance of ca. 250 m a second plot covering an area of ca. 40–50 m^2.[40] At the monastery of Chariton the remnants of terraced garden plots totaling more than 18,000 m^2 can still be seen (Fig. 10).[41]

On the Greek mainland a garden played an important role in the daily routine of the hermit Luke the Younger of Steiris. We learn from his vita that he planted his vegetable plot (here called a *paradeisos*) not for his own sustenance, but rather to keep himself busy with manual labor and to provide food and "ample delight to the eyes" of his visitors. His garden, although small, "was planted with . . . every variety of vegetables" and provided such an abundance that he gave the produce away with a liberal hand.[42] Some guests were invited to pick the vegetables themselves and to cook them at the hermitage for their meal.[43]

[39] *Vita* of Kyriakos, chap. 16, ed. Schwartz, *Kyrillos,* 232.25–29.

[40] Hirschfeld, *Desert Monasteries,* 220. Another garden plot was found at a hermitage near 'Ein er-Rashash in the northern Judaean desert; it had a terrace wall, was watered by a spring, and measured 5.5 × 1.2 m; cf. ibid., 218.

[41] Hirschfeld, *Desert Monasteries,* 200.

[42] *V. Luc. Steir.,* chap. 19. See also chaps. 54–55 for the garden he planted at another hermitage later in his career. Chapter 41 relates how Luke brought a gift of vegetables from his garden to the bishop of Corinth.

[43] *V. Luc. Steir.,* chap. 28.

8 A Bedouin garden near St. Catherine's monastery, Mount Sinai (photo: after *Aramco World*, March–April 1995, 25)

9 Cliffside hermitage with garden terrace near Choziba, Judean desert (photo: Y. Hirschfeld)

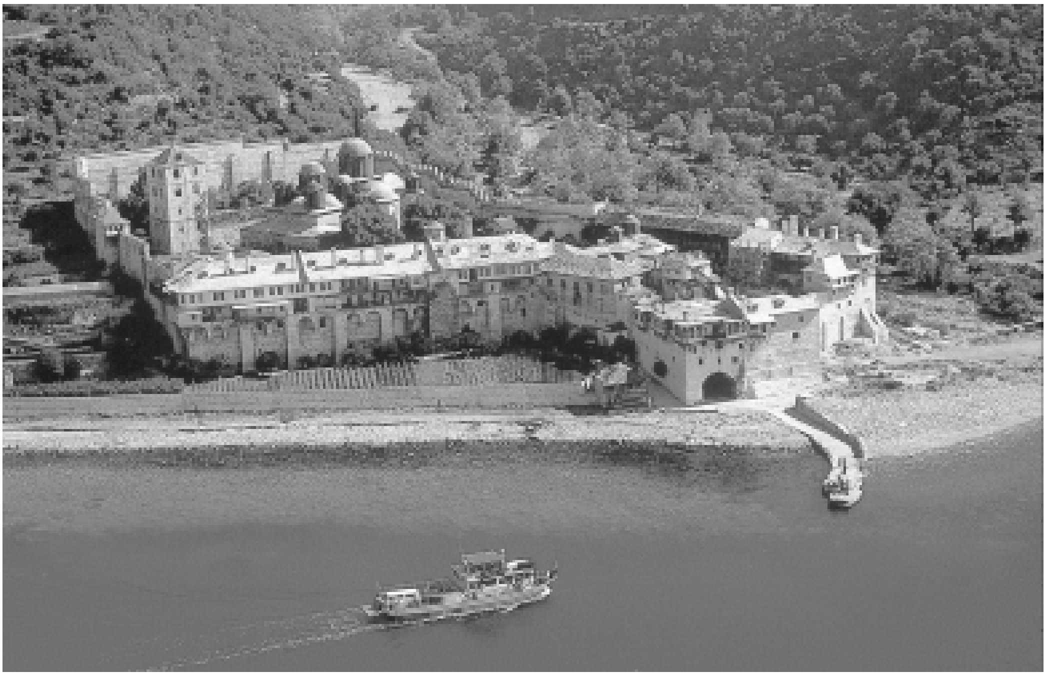
10 Remains of terraced gardens at the monastery of Chariton, Judean desert (photo: Y. Hirschfeld)

The planting of gardens, orchards, and vineyards was one of the first steps in the foundation of a new monastery complex, undertaken simultaneously with the construction of a church and cells. The intertwining of the establishment of garden and church (Fig. 11), as the two essential elements of monastery foundation, is demonstrated by a passage in the typikon for the monastery of the Savior at Messina. Its founder Luke writes that he planted the monks, "like some sacred shoots in this spiritual paradise of Christ. Then we most frequently irrigated <them> with the sweet and most fresh springs of the sacred commands and teachings." In a subsequent paragraph he describes how he established "olive groves and vineyards, vegetable gardens, and very large buildings in the fields to receive the fruits of the harvest time and to serve as quarters for those laboring out there. In some places, too, we built and planted holy churches."[44]

[44] Typikon of Luke, ed. J. Cozza-Luzi, "De typico sacro messanensis monasterii archimandritalis," *Novae patrum bibliothecae* 10.2 (1905), 126; the English translation is a slightly modified version of that by T. Miller, *Documents,* 645. See also chap. 24 of the *vita* of Germanos of Kosinitza, where the planting of vineyards and gardens is mentioned in the same sentence as the construction of cells (*AASS,* May 3:10*B).

11 A monk gardening at the Great Meteoron monastery, Thessaly
(photo: Great Meteoron monastery)

12 Gardens outside Koutloumousiou monastery, Mount Athos
(photo: after Koutoumanos, *Athos from the Heavens*)



13 Walled gardens outside Xenophontos monastery, Mount Athos (photo: after Koutoumanos, *Athos from the Heavens*)

Gardens, vineyards, and orchards were planted both within and without the cloister walls, depending no doubt on the size of the monastery and the nature of the terrain (Fig. 12). They were typically walled (Fig. 13) and had a gate to keep out animals, both domesticated and wild.[45] They provided the bulk of the monastic diet, which consisted primarily of bread,[46] leafy and leguminous vegetables, fruit, wine, and olive oil. Dairy products, eggs, and fish were consumed more sparingly. Hagiographic and documentary sources provide more details about the varieties of vegetables grown in monastery gardens: the generic greens or λάχανα (which probably included lettuce, cabbage, and other leafy greens), onions, beets, squash, leeks, carrots, garlic, cucumbers; among the legumes were broad beans and chickpeas. Fruits such as apples, peaches, pears, figs, mulberries, cherries, grapes, melons, pomegranates, and oranges are known to have been grown in Greece and Anatolia, with dates and carobs being a staple in the Near East.[47] The hagiographic sources reveal an ambivalent monastic

[45] Cf. D. Papachryssanthou, "Un confesseur du second Iconoclasme: La vie du patrice Nicétas (†836)," *TM* 3 (1968): 335, chap. 11; *V. Niceph.,* 168.14–15. See also J. Lefort, N. Oikonomidès, et al., *Actes d'Iviron,* vol. 1 (Paris, 1985), 157.

[46] Hirschfeld, "Importance of Bread."

[47] Information on the varieties of fruits and vegetables available in monasteries has been drawn from Hirschfeld, "Importance of Bread," 149–50; Hirschfeld, *Desert Monasteries,* 86–88; the Dumbarton Oaks Hagiography Database; and J. Koder, *Gemüse in Byzanz* (Vienna, 1993). For the reference to a Seville or bitter orange tree (*nerantza*) at the monastery of Argyroi, killed by frost, see Theodore Balsamon's epigram of lamentation, ed. K. Horna, "Die Epigramme des Theodoros Balsamon," *Wiener Studien* 25 (1903): no. xxxi, pp. 193–94; for the name of the monastery, see R. Janin, *La géographie ecclésiastique de l'Empire byzantin,* vol. 1, *Le siège de*

attitude toward the consumption of fruit: in many texts, fruit is considered a standard part of the monastic diet, suitable for ascetics,[48] while elsewhere it seems to be considered as a special treat and is described as the favorite food of children.[49] Aromatic plants such as mint and cumin added flavor to food and were also used in the preparation of a hot drink called *eukration* or *kyminaton*.[50] Besides fruits and vegetables, groves of nut and olive trees provided additional food sources, as well as oil, and vineyards offered grapes for fresh and dried fruit, wine, and vinegar.[51]

The written sources furnish virtually no information on the location of the garden within the monastic complex, nor the layout of its beds. We can perhaps get an idea of how such a garden may have looked from the idealized plan for a vegetable garden at the ninth-century western medieval monastery of St. Gall (Fig. 14). The garden is depicted with eighteen beds, probably raised above the ground, each holding a different kind of vegetable or herb. Walter Horn has suggested that this was a kitchen garden, where flavorful supplements to the primarily vegetarian monastic diet were cultivated. He argues that root vegetables, squashes that grow on vines, cabbages, and legumes that take up a lot of room were grown in more spacious gardens outside the monastery walls. Nonetheless, cabbage and lettuce are mentioned on the St. Gall plan, along with onions and parsnips. In addition, the garden grew garlic, celery, radishes, and chard, as well as herbs such as parsley, chervil, dill, and coriander. The St. Gall vegetable garden was located right next to the orchard, which curiously enough also served as the cemetery (Fig. 15). Horn has pointed out the convenient location of the vegetable garden near the poultry runs and the monks' latrine, suggesting that both animal and human waste was used as fertilizer.[52] Such use of manure in Byzantine monastery gardens is attested by a passage in the *vita* of Athanasios of Athos which explicitly describes the use of animal manure as garden fertilizer.[53]

Constantinople et le patriarcat oecuménique, pt. 3: *Les églises et les monastères* (Paris, 1969), 51 (hereafter Janin, *Églises*), and S. Lampros, "Ὁ Μαρκιανὸς κῶδιξ 524," Νέος Ἑλλ. 8 (1911): 135, and 15 (1921): 428.

[48] Cf., for example, *vita* of Theodore of Edessa, ed. I. Pomialovskii, *Zhitie izhe vo sv. ottsa nashego Feodora arkhiepiskopa Edesskogo* (St. Petersburg, 1892), 99.9–11; *The Life of Irene, Abbess of Chrysobalanton,* ed. J. O. Rosenqvist (Uppsala, 1986), 54.22–24, 76.2–3 (hereafter *V. Irene Chrys.*); I. van den Gheyn, "Acta graeca ss. Davidis, Symeonis, et Georgii Mitylenae in insula Lesbo," *AB* 18 (1899): 224.6–7; L. Petit, "Vie de saint Michel Maléinos," *ROC* 7 (1902): 568.6; M. B. Cunningham, *The Life of Michael the Synkellos* (Belfast, 1991), 68.17–18.

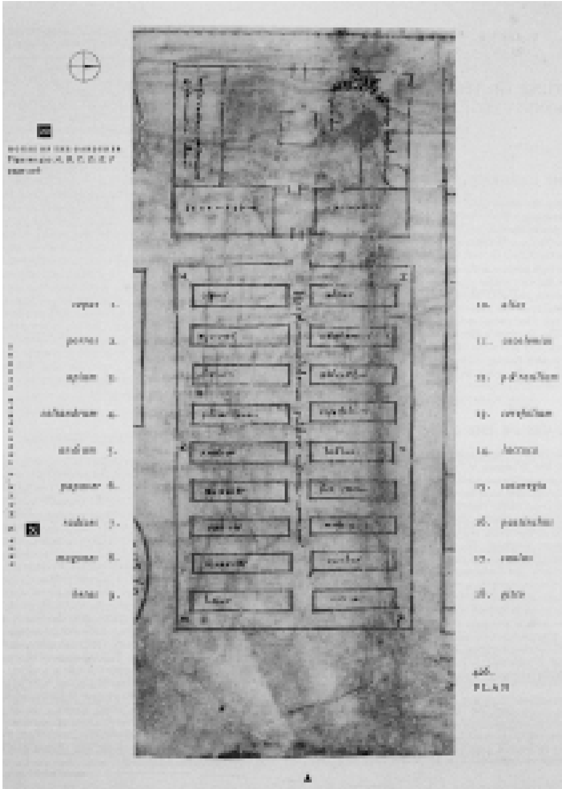
[49] In his rules on monastic penances, Theodore of Stoudios stipulates that anyone who tastes fruit before it is blessed by the priest is to be deprived of it for the ensuing year (PG 99:1749A). This is the only food so singled out. For fruit being the favorite food of children, see *V. Luc. Steir.,* chap. 3, and D. Sullivan, *The Life of Saint Nikon* (Brookline, Mass., 1987), 258, chap. 75.19–20.

[50] For cumin, see *V. Luc. Steir.,* chap. 30; on *eukration,* Hirschfeld, *Desert Monasteries,* 88–89; on *kyminaton,* P. Gautier, "Le typikon de Théotokos Kécharitoménè," *REB* 43 (1985): 95.1345, 97.1382.

[51] For this we have not only textual evidence, but also the actual remains of wine and oil presses at monasteries; cf. Hirschfeld, *Desert Monasteries,* 106–11, and R. Frankel, "Oil and Wine Presses in the Southern Levant in Antiquity," *DOP* 51 (1997): 73–84.

[52] W. W. Horn and E. Born, *The Plan of St. Gall,* vol. 2 (Berkeley, Calif., 1979), 203–8.

[53] *V. Athan. Ath. (A),* 81, chap. 173.4–7. This passage is linked with the cleaning of latrines, but there is no explicit statement that night soil was used as fertilizer. In this connection A. R. Littlewood has pointed out to me that Columella, in the 1st century A.D., recommended the use of human excrement as fertilizer, although he preferred bird dung, especially that of pigeons; cf. his *On Agriculture,* 2.14.1–2, trans. H. B. Ash (Cambridge,



14 Plan of the vegetable garden at St. Gall (photo: after W. W. Horn and E. Born, *The Plan of St. Gall,* vol. 2 [Berkeley, Calif., 1979], 204, plan 426)

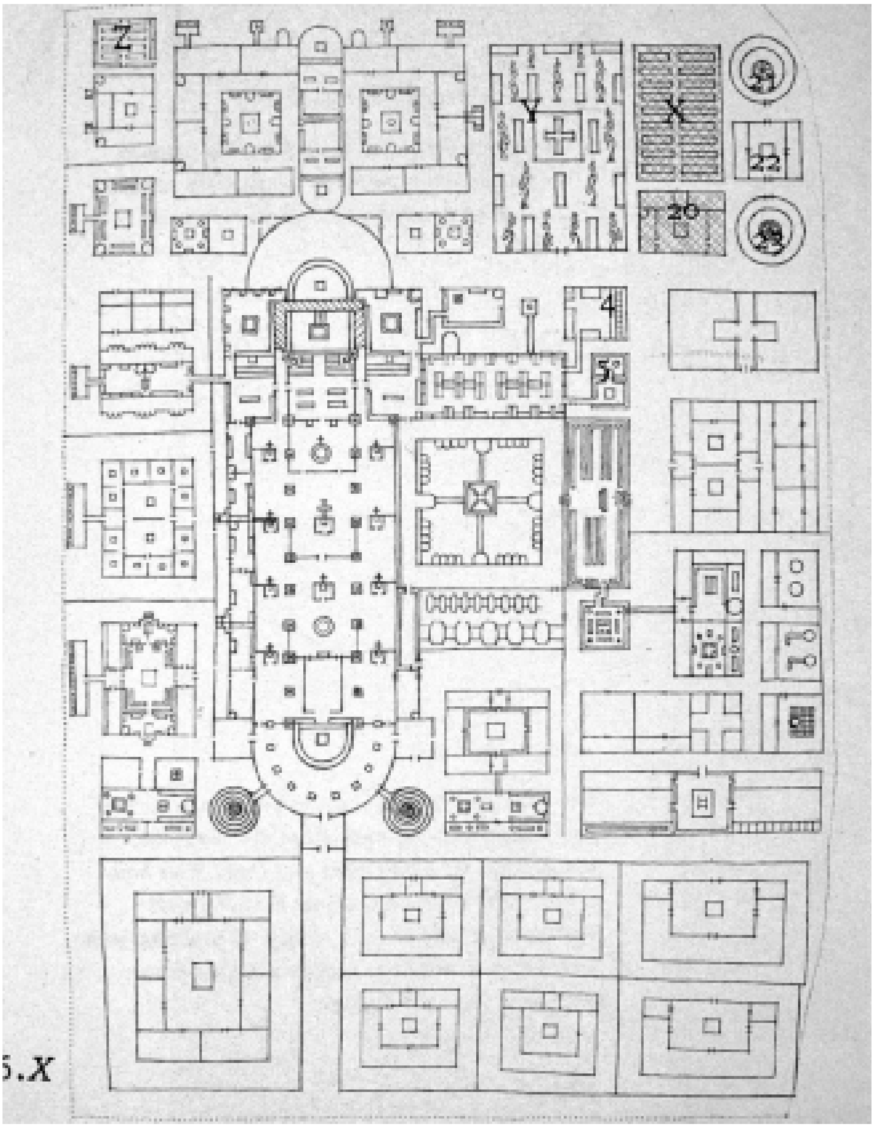
Herb Gardens

The textual sources on Byzantine monasteries contain only the scantiest of allusions (and those indirect) to medicinal herb gardens, such as are familiar to devotees of Brother Cadfael, the twelfth-century Welsh herbalist detective created by Ellis Peters. Even so, I would argue that most Byzantine monasteries must have grown herbs for medicinal and culinary purposes, despite the virtual lack of hard evidence.[54] I draw this conclusion from the following facts: Byzantine monastic complexes often included infirmaries and hospitals, both for their own religious and for laypeople; the hospitals employed pharmacists, who prepared the herbal remedies that were staples of both traditional Greco-Roman and popular medical practice;[55] the aromatic herbs used in cooking and the preparation of hot drinks

Mass., 1941), vol. 1, 195.

[54] One must assume that herb gardens were in fact so common that there was no need to mention them. Still it seems curious that there is no discussion of the cultivation of such gardens in monastic rules.

[55] E.g., typikon of Lips, ed. H. Delehaye, *Deux typica byzantins de l'époque des Paléologues* (Brussels, 1921), chap. 51; P. Gautier, "Le typikon du Christ Sauveur Pantocrator," *REB* 32 (1974): lines 997, 1205, 1207, 1216, 1219. A scholium on a legal text describes pharmacists (πημεντάριοι) as "those assigned to gather herbs and bring them to the infirmary; they also are in charge <of preparing> the medicaments"; cf. C. DuCange, *Glossarium ad Scriptores Mediae et Infimae Graecitatis* (Leiden, 1688), 1167, and R. Volk, *Gesundheitswesen und Wohltätigkeit im Spiegel der byzantinischen Klostertypika* (Munich, 1983), 145 n. 446. Also the Pantokrator typikon (ed. Gautier, "Pantocrator," lines 1209–10) refers to the "gathering of herbs (βοτανολόγιον) in the month of May" by the



15 Diagram of site plan of St. Gall (photo: after Horn and Born, *The Plan of St. Gall*, 205, plan 426X)

may also have been used therapeutically; the Prodromos in Petra monastery in Constantinople, associated with a hospital, owned a manuscript of the famous herbal treatise of Dioskorides, now in Vienna.[56] Finally, in the post-Byzantine and modern periods, herbalists and herb gardens are attested at the monasteries of Mount Athos (Fig. 16).[57]

pharmacists, although it does not specify whether they were wild or grown in gardens.

[56] Among the monks who made notations in the manuscript was a certain Nathanael, who was a doctor at the Xenon of the Kral in the early 15th century; cf. *ODB,* 1:632, s.v. "Dioskorides."

[57] Cf. *Simonopetra,* 106, which alludes to a modern medicinal herb garden at Simonopetra.

16 A monk gathering herbs, Mount Athos (photo: A. R. Littlewood)

Stories from hagiographic texts provide further indications that monks had some familiarity with herbal medicine and that medicinal herbs were used in a monastic context in the Byzantine era. During the course of a long journey, Athanasios of Athos is said to have healed the sore foot of a fellow monk by picking some wild herbs and pounding them into a paste that he applied to the skin. He covered the medicinal paste with a bandage of plane tree leaves.[58] A fourteenth-century account of the miracles of St. Eugenios of Trebizond relates that a man suffering from a serious ear infection sought aid from a monk, who was asked "if he knew any herbs with which to treat someone suffering from this disease."[59] Finally, in the fourteenth-century *Miracula* of the Pege monastery in Constantinople, we read about a leper who bathed himself in the outlet of the miraculous Pege spring located at some distance from the church, rubbing himself with mud, hyssop (a European mint, cultivated in gardens as a remedy for bruises), and some of the wild herbs growing next to the water.[60]

[58] *V. Athan. Ath. (A),* 45–46, chap. 97.

[59] J. O. Rosenqvist, *The Hagiographic Dossier of St. Eugenios of Trebizond in Codex Athous Dionysiou 154* (Uppsala, 1996), 303 and 430, note on line 1011.

[60] *Logos* of Nikephoros Kallistos Xanthopoulos, ed. A. Pamperis, Νικηφόρου Καλλίστου Ξανθοπούλου περὶ συστάσεως τοῦ σεβασμίου οἴκου τῆς ἐν Κωνσταντινουπόλει Ζωοδόχου Πηγῆς καὶ τῶν ἐν αὐτῷ ὑπερφυῶς τελεσθέντων θαυμάτων (Leipzig, 1802), no. 52, p. 70.

Regretfully there is no Byzantine source to correspond to the information on the ninth-century medicinal herb garden found in the plan of the St. Gall monastery (Fig. 17), nor the contemporary poem of Walahfrid Strabo on the herb garden at the monastery of Reichenau. The St. Gall herb garden, which was walled, was conveniently located in the part of the monastery that contained the infirmary (see Fig. 15). Sixteen different species of herbs grew there, including rosemary, lovage, fennel, and mint, each planted in a separate bed.[61]

Flower Gardens, Shrubs, and Trees

I have also found very little information on flowering plants and trees grown for aesthetic rather than practical purposes, such as are a common feature of modern Greek monastery courtyards (Fig. 18). There are some archaeological indications at the monastery of Khirbet-ed-Deir in the Judean desert that vines were grown on a trellis to provide shade for the courtyard,[62] and the *Lausiac History* of Palladios describes a grapevine that grew all over the church at the Douka monastery near Jericho.[63]

The cypresses that adorned many monastery courtyards are interpreted by Theodore Metochites as symbolizing the spiritual ascent of monks: "the cypress, . . . in rising even to the skies, . . . proclaims without artifice to those who meditate there the way in which they are to walk and strive upward, laying aside gradually as they go up the excess of their material part and growing thinner as they rise."[64]

Wild Animals and Gardens

One of the commonplaces in hagiographical descriptions of gardens is the intervention of wild beasts, normally in a destructive capacity but sometimes in a protective role. St. Antony, one of the earliest monastic gardeners, had to contend with the ravages of wild animals who would trample his vegetables as they came to the spring to drink. The garden of the hermit Kyriakos was a favorite haunt of wild goats, and deer trampled the beloved vegetable plot of St. Luke the Younger.[65] Bears and wild pigs are also described as invading gardens and eating vegetables under cultivation.[66] Often these stories introduce an account of the holy man's miraculous command over wild animals, as he paralyzes a marauding deer,[67] keeps a bear from eating a squash, causes a boar to drop dead as soon as it touches the

[61] Horn and Born, *St. Gall,* 2:181–84.

[62] Hirschfeld, *Desert Monasteries,* 194–96.

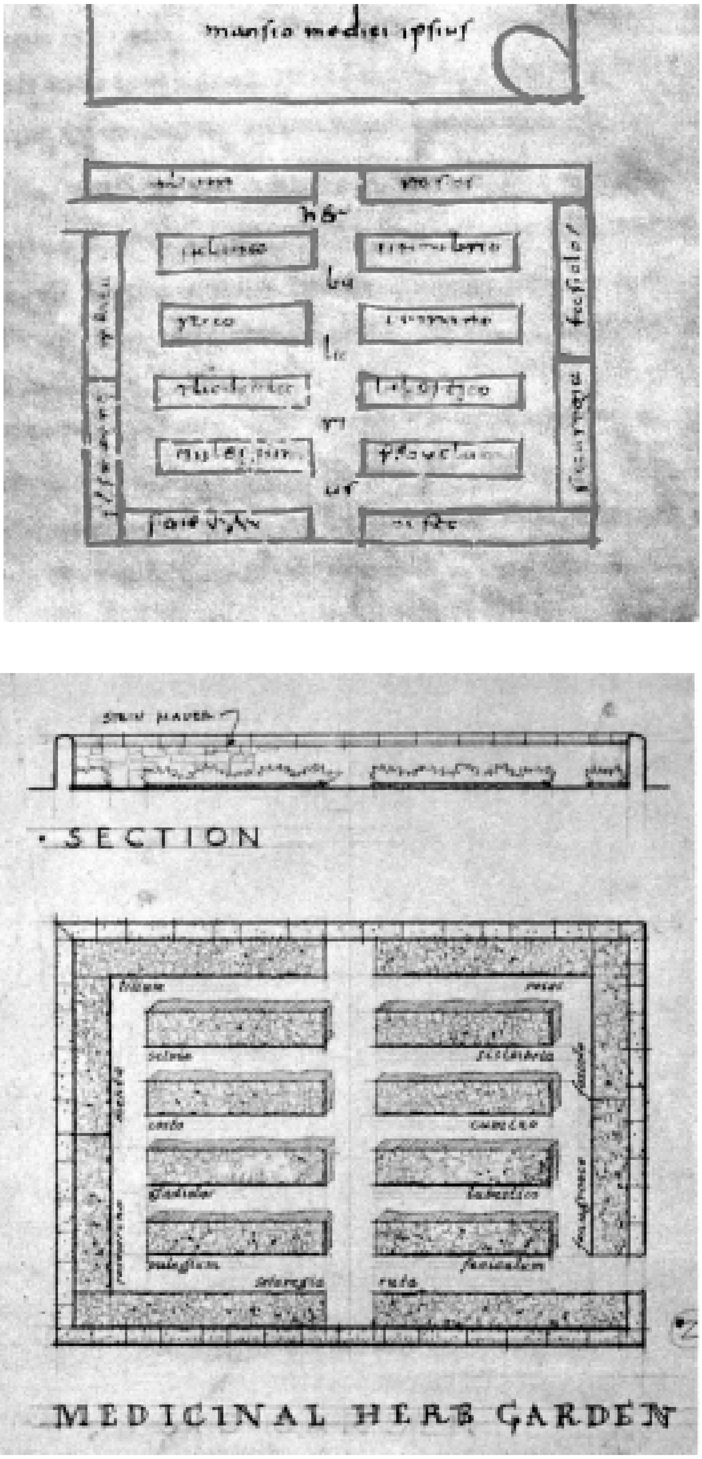
[63] C. Butler, *The Lausiac History of Palladius,* vol. 2 (Cambridge, 1904), 143.3–7. A. R. Littlewood informs me that in 1971 such a grapevine was growing on a trellis outside the *katholikon* of Chilandar (letter of 14 May 1998).

[64] Metochites, *The Nicene Oration,* chap. 11, trans. C. Foss, *Nicaea: A Byzantine Capital and Its Praises* (Brookline, Mass., 1996), 181.

[65] *Vita* of Antony, PG 26:916C–917A; trans. Meyer, *Life of Antony,* chap. 50; *vita* of Kyriakos, ed. Schwartz, *Kyrillos,* 232; *V. Luc. Steir.,* chap. 19.15–18.

[66] Cf. *La Vie ancienne de s. Syméon Stylite le Jeune,* ed. P. van den Ven, vol. 1 (Brussels, 1962), 155–56, chap. 176; *V. Christoph. et Macar.,* chap. 15.

[67] *V. Luc. Steir.,* chap. 19.



17 Plan of the medicinal herb garden at St. Gall (photo: after Horn and Born, *The Plan of St. Gall*, 182, figs. 414 [*top*] and 414Y [*bottom*])

garden fence,[68] employs a lion to guard his garden against wild goats,[69] or uses words alone to persuade wild animals to stay away from his vegetables.[70] At the same time they symbolize the monk's control over nature: not only does he subdue the forest or desert with his hoe, but he alters the behavior of the wild fauna which inhabit this domain, and whose intrusion may represent nature's attempt to reassert itself.

Monastic Gardeners

Gardening was part of the manual labor performed by monks (Fig. 19). Since it involved arduous physical exertion, garden chores were often assigned to novices or young monks. Matrona of Perge and Theodora of Alexandria, two young nuns who had disguised themselves as monks, were set to work in the garden,[71] as was the young George upon his arrival at Choziba and Sabas at the monastery of Flavianae.[72] At the Pantokrator monastery, gardeners were ranked as servitors (δουλευταί) together with the bakers and cooks.[73] Other evidence as to the relatively lowly status of the gardener (κηπουρός) is found in the typikon of the St. Mamas monastery: the monastery's gardener, two vinedressers, and the baker used the sign of the cross for their signatures, an indication of their illiteracy.[74] A more explicit indication of the illiteracy of vinedressers is provided by the twelfth-century typikon of Neophytos the Recluse, who states that because he had never been taught his letters he was assigned by the abbot to work in the vineyards. Only after five years of manual labor tending vines, when he had mastered the rudiments of reading and writing, was he given the position of assistant sacristan (*parekklesiarches*).[75] On the other hand, an educated and advanced monk might show his humility through horticultural labors; St. Hilarion, for example, worked in the garden of the Dalmatos monastery for ten years even though he had attained the great habit, to demonstrate his obedience to the abbot.[76] Likewise, Emperor Romanos I is known to have tended a plot of lentils after he retired to monastic life following his deposition from the throne.[77]

[68] *V. Sym. Styl. Jun.,* chap. 176.

[69] *Vita* of Kyriakos, chap. 16, ed. Schwartz, *Kyrillos,* 232.12–25.

[70] Cf. *V. Christoph. et Macar.,* chap. 15; chap. 50 of *vita* of Antony the Great, PG 26.916–17; trans. Meyer, *Life of Antony,* 63, chap. 50.

[71] *Vita* of Matrona of Perge, *AASS,* Nov. 3:792F, chap. 5; K. Wessely, "Die Vita s. Theodorae," *Jahresbericht des k. k. Staatsgymnasiums Hernals* (Vienna, 1889): 29.3–7; 32.3–4, 9; 41.9–12.

[72] (C. Houze), "Sancti Georgii Chozibitae confessoris et monachi vita auctore Antonio eius discipulo," *AB* 7 (1888): chap. 4, p. 99.4; *vita* of Sabas, ed. Schwartz, *Kyrillos,* 88.18. Other monastic gardeners include Elias Spelaiotes, who dug in the fields and garden even though he had only one good hand (*vita* of Elias Spelaiotes, *AASS,* Sept. 3:853B, par. 13), and Euthymios the Younger, who was attacked by demons while he was irrigating his garden (L. Petit, "Vie et office de St. Euthyme le Jeune," *ROC* 8 [1903]: 194.23–24). See this page (and note 76) for Hilarion of Dalmatos, who worked as a gardener for ten years at an early stage of his monastic career.

[73] Pantokrator typikon, ed. Gautier, "Pantocrator," 61.543.

[74] S. Eustratiades, "Τυπικὸν τῆς ἐν Κωνσταντινουπόλει μονῆς τοῦ ἁγίου μεγαλομάρτυρος Μάμαντος," *Hellenika* 1 (1928): 304.

[75] Tsiknopoullos, Κυπριακὰ τυπικά, 75.

[76] *Synaxarium,* 731–32. 52–53.

[77] See Liudprand, *Antapodosis,* 5.25, trans. F. A. Wright, *The Works of Liudprand of Cremona* (London, 1930), 194. I am indebted to A. R. Littlewood for this reference.

18 Flower garden at the Pantanassa monastery, Mistra
(photo: T. Gouma-Peterson)

19 A monk gardening at the monastery of St. Paul, Egypt
(photo: H. von Aderkas)

Theodore of Stoudios describes the principal duties of the gardener as sowing the vegetable seeds and watering and cultivating the vegetables so as to provide sufficient food for the monastic community. Failure to carry out these duties was punished by performing fifty to a hundred penitential prostrations (*metanoiai*). The vinedresser was responsible for pruning, hoeing, and otherwise tending the grapevines.[78] The only evidence that nuns worked in convent gardens is found in the typikon of the Cretan nunnery of Damilas, where the two portresses were excused from shooing away birds and watering the plants and vines in the garden and vineyard;[79] one may infer that these tasks were normally included among the duties of the other nuns (Fig. 20). Depending upon the size and location of the monastery gardens, outside lay workers might also be hired for horticultural work: at the nunnery of Chrysobalanton in Constantinople, for example, a young lay vinedresser named Nicholas fell in love with one of the nuns of whom he caught sight while working in the vineyard right next to the convent wall.[80]

Horticulture in Urban Monasteries

So far I have focused on monasteries located in the countryside and explored ways in which monks converted forest or desert into gardens. In turning briefly to urban monasteries, and the impact of monastic gardens on the cityscape, I limit myself to the case of Constantinople. Monasteries were an important aspect of the urban scene of the capital from the early period of its development. Little attention has been given so far to the siting of monasteries in the capital, but it would be interesting to study the locations of new foundations over the centuries to see if there was any preference for sites on a hill, or with a sea view, or in a quiet suburb. Some monasteries were established in semi-rural regions just outside or even within the city walls, in spacious calm surroundings with a beautiful natural setting. Others, founded in the very heart of the city, were built in a more constricted space and probably limited horticultural activity to the interior of the complex.

Prokopios notes, for example, that Justinian established the Pege monastery (Fig. 21) in a suburb where there "is a dense grove of cypresses and a meadow abounding in flowers . . . , a garden abundant in beautiful <plants>, and a spring bubbling silently forth with a gentle stream of sweet water."[81] There is abundant evidence that many urban monastic complexes incorporated gardens and vineyards within or immediately outside their enclosure walls.[82] The early fifteenth-century traveler Clavijo comments, for instance, on the gardens, or-

[78] PG 99:1744A. At the Lavra on Mount Athos, vinedressers received extra rations of wine on the days when they pruned the vine branches; cf. Meyer, *Haupturkunden,* 139.

[79] S. Petridès, "Le typikon de Nil Damilas pour le monastère de femmes de Baeonia en Crète (1400)," *IRAIK* 15 (1911): 108.

[80] *V. Irene Chrys.,* chap. 15, p. 66.15–16: τὸν μισθοῦ τὸν τῆς μονῆς ἀμπελῶνα καλλιεργοῦντα.

[81] Prokopios, *Buildings,* 1.3.6, trans. H. B. Dewing, *Procopius,* vol. 7 (London-Cambridge, Mass., 1940), 41.

[82] Vineyards: the convent of Chrysobalanton had a vineyard "situated close by" (*V. Irene Chrys.,* 66); a vineyard adjoined the Chora monastery (L. Deubner, *Kosmas und Damian* [Leipzig-Berlin, 1907], miracle no. 47, p. 206.54); for vineyards within the monastery of Athanasios on Xerolophos, see MM, 2:82. Gardens: for the garden at the monastery of Christ Philanthropos, see Gautier, "Le typikon de Théotokos Kécharitoménè," 139.2124.

20 Nuns gardening at the convent of Ormylia, Greece
(photo: after S. A. Papadopoulos, *Ormylia* [Athens, 1992], fig. 101)

chards, and vineyards located within the precincts of the monasteries of the Prodromos of Petra, Peribleptos, and St. George.[83] A chapter from Theodora Synadene's typikon for the nunnery of Sure Hope, describing the perimeter wall of the convent, provides a vivid image of the abundance of gardens in the vicinity of the monastic complex: the wall goes along the boundary between her son's garden and the convent garden; it then passes another garden and comes to Theodora's own apartments, where it passes by her garden, having on its left the vineyard of Theodora's sister; later the wall passes by the vineyard for which she herself had arranged the planting.[84]

In addition to cultivated plots within or immediately adjoining the monastic complex, monasteries acquired by purchase or donation gardens, orchards, olive groves, and the like in other regions of the city or in outlying suburbs. These are frequently attested in inventories of monastic property or in synodal acts ruling on disputes over vineyards and gardens belonging to monasteries.[85]

The concern of monastic founders and benefactors not only with the functional purpose but the aesthetic impact of gardens and other plantings is suggested by a passage in the *Chronographia* of Michael Psellos describing Emperor Michael IV's restoration of the Kosmidion monastery; in addition to the refurbished buildings, he mentions "lovely baths,

[83] C. Markham, *Narrative of the Embassy of Ruy Gonzalez de Clavijo* (London, 1859; repr. New York, 1970), 30–31, 39.

[84] Typikon for Bebaia Elpis, ed. Delehaye, *Deux typica byzantins,* chap. 145, p. 95.

[85] E.g., typikon of Lips, ed. Delehaye, *Deux typica byzantins,* chap. 49; MM, 2:394–95, 395–99, 407–10, 410–12, 499–501, etc.

21 Icon of the Zoodochos Pege, 19th century, showing suburban setting of the Pege monastery outside the walls of Constantinople (photo: E. Papazyan)

numerous fountains, beautiful lawns, and whatever else can delight or attract the eye."[86] Likewise Constantine IX Monomachos surrounded the monastery church of St. George of Mangana with "lawns full of flowers," water channels, and basins. "People marvelled at . . . the streams of water, . . . the lawns covered with flowers, the dewy grass, always sprinkled with moisture, the shade under the trees."[87] The eleventh-century patriarch Constantine Leichoudes is praised by Psellos for the construction of waterworks permitting the installa-

[86] *Michel Psellos, Chronographie,* ed. E. Renauld, vol. 1 (Paris, 1926), 72; trans. E. R. A. Sewter, *Fourteen Byzantine Rulers* (Harmondsworth, 1966), 105–6; Janin, *Églises,* 287.

[87] Psellos, *Chron.,* 2:62–63; trans. Sewter, 252.

tion of a garden and lawns at the convent he founded.[88] A twelfth-century dedicatory epigram for the Pantokrator monastery alludes to grass and flowers, fountains, cypress trees, and gentle breezes.[89] The fifteenth-century typikon of Patriarch Matthew I for the Charsianeites monastery stipulates that the abbot is to entertain guests at mealtime only in the refectory, not in the garden, thus implying that he enjoyed dining al fresco.[90] The best evidence on the appearance of urban monastery courtyards is found in Clavijo's account of 1402: he mentions cypress, walnut, and elm trees within various monastic enclosures (Fig. 22).[91]

It is well known that, as the population of Constantinople declined over the centuries, the area within the walls became much less congested, so that at the end of the empire the capital was more like a group of villages separated by wheat fields and vineyards.[92] What has not been sufficiently appreciated is the role played by monastic horticulture in the "greening" of Constantinople, a topic that warrants further investigation.

The Garden as Metaphor for Monastery

It should not be surprising that the Byzantine monastery, whose irrigated gardens stood out in the dry Mediterranean landscape or in the crowded cityscape like a verdant oasis, was often described metaphorically in typika and saints' lives as a *paradeisos,* or garden. What could be more appropriate than that monks and nuns, who led an angelic life and were attempting to recreate the divine paradise,[93] should be alluded to as plants and trees and their monastery as a garden?[94] Some authors, extending the metaphor, referred to the

[88] K. N. Sathas, Μεσαιωνικὴ βιβλιοθήκη, vol. 4 (Paris, 1874), 415–16: ταῦτά τε καὶ ὅσα πέριξ τοῦ ναοῦ θεωρήσας ἐφιλοτεχνήσατο, ὑδάτων τε πεποιημένας ἐν αὐτοῖς ἀγωγάς, καὶ λειμῶνας εὐπρεπεῖς φυτευσάμενος; Janin, *Églises* 305.

[89] Volk, *Gesundheitswesen,* 190.

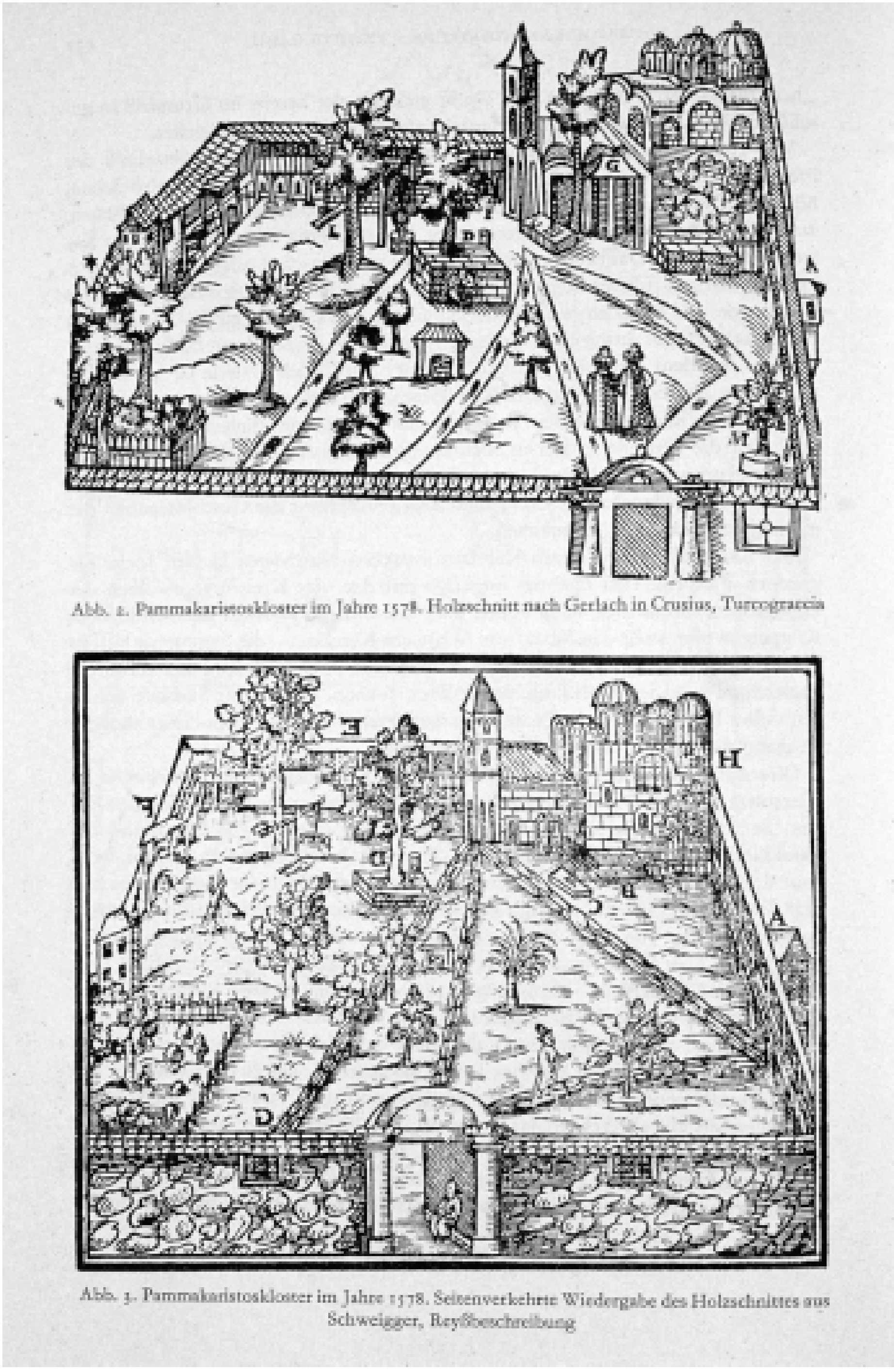
[90] I. M. Konidares and K. A. Manaphes, "Ἐπιτελεύτιος βούλησις καὶ διδασκαλία τοῦ οἰκουμενικοῦ πατριάρχου Ματθαίου Α' (1397–1410)," Ἐπ.Ἑτ.Βυζ.Σπ. 45 (1981–82): 498.965–68.

[91] Markham, *Clavijo,* 30–31, 39. Cf. also the *vita* of Irene of Chrysobalanton, which describes the "two lofty cypresses . . . standing on either side of the forecourt, reaching far up into the air" (*V. Irene Chrys.* 76.17–19). One might also note that the nunnery of St. Matrona in Constantinople was founded on the site of a rose garden (*AASS,* Nov. 3:806D, chap. 36), but we do not know if any roses survived the construction of the monastic complex.

[92] Cf. Markham, *Clavijo,* 46: "Though the city is so large, it is not at all well peopled, for in the middle of it there are many enclosures, where there are cornfields, and fruit gardens." There are similar descriptions by other travelers to Constantinople in the Palaiologan period; cf. J. P. A. van der Vin, *Travellers to Greece and Constantinople* (Leiden, 1980), 1:254; 2:564, 569, 684. It should be noted that even earlier in the history of the capital, during the transition from the late antique to the middle Byzantine period, significant depopulation and abandonment of certain regions of the city occurred; cf. C. Mango, *Le développement urbain de Constantinople (IVe–VIIe siècles)* (Paris, 1985), 51–62.

[93] Cf. the Life of Mary of Egypt, chap. 5 (PG 87:3701C), where the monks of the Judean desert "were admirably re-creating the divine paradise." L. Rydén noted that the goal of the desert father was "to reconstruct the Garden of Eden and anticipate Paradise" ("New Forms of Hagiography: Heroes and Saints," *The 17th International Byzantine Congress: Major Papers* [New Rochelle, N.Y., 1986], 537); cf. also M. Angold, "Were Byzantine Monastic *Typika* Literature?" in *The Making of Byzantine History: Studies Dedicated to Donald M. Nicol* (Aldershot, 1993), 61.

[94] Out of numerous examples, I note the following: *vita* of Nicholas of Stoudios (PG 105:877A and



22 Constantinople, Pammakaristos monastery in 1578, woodcuts (photo: after H. Hallensleben, "Untersuchungen zur Baugeschichte der ehemaligen Pammakaristoskirche, der heutigen Fethiye camii in Istanbul," *Istanbuler Mitteilungen* 13/14 [1963–64]: 132, figs. 2 and 3)

abbot or abbess as a gardener who nurtured his or her charges with the waters of spiritual instruction.[95] One could cite the case of St. Matrona of Perge, whose convent in Constantinople was built appropriately on the site of a former rose garden and had herself worked for a while as a gardener while a monk in disguise; she is described by her hagiographer as a "spiritual husbandman who, receiving neglected and barren souls, tended them with careful and experienced ascetical attention; and when they had become fruitful through good works she offered them to Christ."[96] The future patriarch Ignatios (847–858, 867–877) as a young monk "was planted in the house of the Lord like a sapling, and having flowered in the courts of monastic life," he soon bore fruit.[97] The twelfth-century bishop Leo of Argos used the metaphor of transplantation of plants to describe his transfer of the nuns of Areia to a safer location at Bouze: "Just as one can see gardeners and farmers acting in accordance with their skill, and now setting the seedling of a plant in the earth and tending it for a while, and then removing it from there and transplanting it somewhere else, so that thereby the plant may proceed to firmer rooting and greater growth and earlier bearing of fruit, it so happened that I did this at this monastery."[98] It should also be noted that, like the typical garden, the monastery was enclosed by a wall and had a gate.

Variations on this theme include comparisons of a nunnery with a vineyard, "having virgins and nuns within like flourishing and beautiful vine branches, teeming with numerous large and excellent bunches of grapes,"[99] or monks described as a swarm of bees set in the midst of a garden blooming with evergreen plants and all sorts of flowers.[100] The horticultural imagery was even extended to the monastic peninsula of Mount Athos, where numerous manmade gardens, vineyards, orchards, and olive groves complemented the naturally verdant landscape; the holy mountain was sometimes called "the garden of the Panagia [the Virgin Mary]."[101]

901d–904a, where the garden is more specifically called a rosebed); *Ignatii diaconi vita Tarasii archiepiscopi Constantinopolitani,* ed. I. A. Heikel (Helsingfors, 1891), 403.18–19; *vita* of Theodore of Stoudios, PG 99:233b, 248a, 273b; H. Grégoire, "Saint Démétrianos, évêque de Chytri (île de Chypre)," *BZ* 16 (1907): 221.129–31; G. Rossi Taibbi, *Vita di Sant'Elia il Giovane* (Palermo, 1962), 44.595–46.597 and 120.1636–39 (where the monastic virtues are equated with the fruit of the garden and the profession of the faith constitutes evergreen leaves, which never fall from the trees); S. A. Paschalides, Ὁ βίος τῆς ὁσιομυροβλύτιδος Θεοδώρας τῆς ἐν Θεσσαλονίκῃ (Thessalonike, 1991), chap. 24, p. 114, where Theodora is compared with a fruit tree that brings forth fruit in season; Pantokrator typikon, ed. Gautier, "Pantocrator," 63.565–67.

[95] Cf., for example, *V. Laz. Gal., AASS,* Nov. 3:580a: ἐμαυτὸν Θυτοκόμον εἶναι λογίζομαι Θυτεύοντα διάφορα φυτὰ καὶ κατὰ δύναμιν ἀρδεύω τε ταῦτα καὶ τὴν λοιπὴν περὶ αὐτὰ ἐνδείκνυμαι ἐπιμέλειαν. See also P. Karlin-Hayter, *Vita Euthymii patriarchae CP* (Brussels, 1970), 25, where Euthymios refuses to take over the leadership of an existing monastery, saying, "God forbid that ever I should water another's plantation," and that he did not want to divert the work of others into "the channels of my laws and rules."

[96] *Vita* of Matrona of Perge, *AASS,* Nov. 3:811d, chap. 48.

[97] *Vita* of Patriarch Ignatios, PG 105:493d.

[98] G. A. Choras, Ἡ Ἁγία Μονὴ Ἀρείας (Athens, 1975), 239; note a similar horticultural metaphor at pp. 243–44.

[99] Typikon of Bebaia Elpis, ed. Delehaye, *Deux typica byzantins,* chap. 11, p. 26.5–9.

[100] This image is found in a dream vision of St. Elias Spelaiotes; cf. *AASS,* Sept. 3:864d, chap. 40.

[101] Cf. E. Amand de Mendieta, *Mount Athos: The Garden of the Panaghia* (Berlin, 1972).

Conclusion

The establishment of gardens and vineyards was an essential element of the foundation of most monasteries, except for those establishments that gave absolute priority to matters of the spirit: the monks had to clear tracts of virgin forest, terrace and fence the earth, store and channel water, and plant fruits and vegetables, so as to obtain a regular food supply. In the urban environment, monastery courtyards and gardens added open green spaces to the cityscape and afforded pleasant vistas for monastic residents and visitors alike. In building monasteries embellished with gardens, a secondary purpose was served as well: the creation of miniature versions of paradise on earth, where the abbot as spiritual gardener could nurture his seedlings with the waters of instruction in the scriptures and the patristic tradition to encourage the monks' spiritual growth.

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Byzantine Gardens and Horticulture in the Late Byzantine Period, 1204–1453: The Secular Sources

Costas N. Constantinides

Despite the attractiveness of the theme and the work of colleagues in recent years,[1] the Byzantine garden is still not well known, mainly because of the paucity of sources. I have chosen to examine, by use of the secular literature, the late Byzantine period, from ca. 1204 to the fall of Constantinople to the Ottoman Turks in 1453. This period seems to have been less thoroughly investigated than have most earlier periods, and a concentration on it should produce a more coherent picture than another attempt to cover the whole span of Byzantine history. It is, moreover, the only period from which there survives any sizable quantity of documentary evidence for productive gardens.

During these last 250 years of Greek rule, conditions drastically curtailed the tradition, which stretched back to Hellenistic times, of building luxurious villas, mostly outside the cities, with pleasing gardens, as appear in mosaics and frescoes or are recorded in texts. At a time when the safety of the countryside was shaken, especially after around 1300, this had become practically impossible. Nevertheless, it appears that the declining empire continued to uphold the ideals and culture it had preserved for centuries. Although the pleasure garden seems to have been gradually replaced by the profitable vegetable garden, or the flower garden of the household by the kitchen garden, there were individuals of considerable culture and wealth who could, always within the limits of Christian piety, appreciate pleasure gardens and ensure their continued existence, however precarious, in the big cities. Poets used the color and fragrance of flowers in their poetry; rhetoricians, following an old tradition, spoke appreciatively of the presence of gardens in cities or outside public buildings in their encomia, or ekphraseis; scholars continued to study and copy the relevant textbooks, like the *Geoponika,* while a few intellectuals went beyond the traditional limits and composed works like the *Porikologos* ("Fruit Book"), where many fruits are presented as

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[1] See A. R. Littlewood, "The Scholarship of Byzantine Gardens," in this volume, 13–21.

taking part in legal procedures satirizing court ceremonial. That flowers continued to exist in the minds of people, though not always in their kitchen gardens, is apparent from the many proverbs in both the high and the demotic style which were in everyday use in both the written and the oral language during the late Byzantine period.

Productive Gardens

During the period under investigation the Byzantines lost much of the countryside that had supplied the towns and cities with fruit and vegetables. Many peasants were forced to abandon their farmlands and take refuge in the walled towns or flee to Constantinople and the other lands still in Christian hands as Turkish tribes advanced quickly through Byzantine territory in both Asia and Europe.[2] This development turned the neglected areas into uncultivated regions of wild nature, while many deserted settlements soon fell into ruins. When Michael VIII Palaiologos took an army into Bithynia in the autumn of 1281 to combat the threat from a Turkish tribe later to be known as the Ottomans, he found the area of the Sangarios River abandoned and impassable. Having known this region well from his service there as a young general some thirty years earlier, he fell into despair on seeing what he described as a "Skythian desert." There were, however, still abundant fruits on the trees, enough to feed his army.[3] That the European lands of the empire suffered a similar abandonment is reported by Pero Tafur, a Spanish traveler, who upon visiting the area of Adrianople in the autumn of 1437 noted that the land, though fruitful, was depopulated by war.[4]

Nevertheless, there were still market gardens and orchards. These were known by a variety of names indicating both size and purpose: *kēpos, kēpion, kēpoperibolion, kēpotopion, kēporeion,* which are all regularly found in Athonite *praktika* (inventories) from the thirteenth century on, refer mostly to vegetable gardens; *ampelokēpion* and *ampeloperibolion* refer respectively to a mixed vineyard and vegetable garden and to a vineyard (Fig. 1) and orchard. These texts employ also, but only very occasionally, the term *paradeisos* (which appears more in rhetorical texts and especially in late Byzantine romances): when used in a literal sense, this means a pleasure garden with flowers and trees mixed together.[5] Unfortunately such

[2] For the Christian refugees who fled from Bithynia in 1302, see G. Pachymeres, *De Michaele et Andronico Palaeologis,* ed. I. Bekker, 2 vols. (Bonn, 1835), 2:335–37. For the decline and abandonment of the city of Sardis in the 14th century, see the patriarchal document of 1382 in MM 2:46.

[3] G. Akropolites, *Opera,* ed. A. Heisenberg, 2 vols. (Leipzig, 1903), 1:163.8; see esp. Pachymeres, *Relations historiques,* ed. A. Failler and trans. V. Laurent (Paris, 1984), 1.6:29, 633.12–637.8 (hereafter Failler-Laurent, *Pachymérès*). A century later, in 1391, Emperor Manuel II Palaiologos passed through the same area while following, as a vassal, the sultan Bayezid I in his campaign against the emirs of Sinope and Kastamouni on the south shore of the Black Sea. Manuel tells us in a letter addressed to his tutor and friend Demetrios Kydones that the marching army came across deserted areas and ruins of cities whose names the antiquarian emperor realized were unknown to the local people. See *The Letters of Manuel II Palaeologus,* ed. G. T. Dennis, CFHB 8 (Washington, D.C., 1977), no. 16; see also J. Barker, *Manuel II Palaeologus (1391–1425): A Study in Late Byzantine Statesmanship* (New Brunswick, N.J., 1969), 90–91.

[4] Pero Tafur, *Travels and Adventures, 1435–1439,* ed. and trans. M. Letts (London, 1926), 128.

[5] See E. M. Jeffreys, "The Question of Western Influence on Greek Popular Verse Romances, with Particular Reference to the Garden-Castle Theme" (B.Litt. thesis, University of Oxford, 1968), esp. 110–13; A. R. Littlewood, "Romantic Paradises: The Rôle of the Garden in the Byzantine Romance," *BMGS* 5 (1979): 102,

1 Parable of the Laborers in the Vineyard. Paris, Bibliothèque Nationale, gr. 74, fol. 39v (photo: Bibliothèque Nationale de France)

documentary texts, while presumably in large part factually accurate, do not describe the actual gardens. For descriptions (usually brief and often vague) we must rely primarily on rhetoricians who frequently, in writing models for their students, merely recycled material from their predecessors, who were writing of quite different locations and were too, of course, more concerned with expressing the beauties of the traditional *locus amoenus* than the specific features that the historian craves.[6] Their general pictures are likely to be largely correct, but all details are suspect.

The historian George Akropolites speaks of a large garden nearly eight stadia (i.e., ca. 1,480 m) outside Thessalonike, called the garden of Provatas. This seems to have been a vegetable garden, and it was there that John III Vatatzes camped with his army in 1242 when trying to recover the city from the separatist rulers of Epiros.[7] A century and a half later we learn from *praktika* that the Athonite monastery of Iveron owned two gardens within the walls of Thessalonike and a large cultivated garden outside the walls close to the Golden Gate (i.e., in the west-southwest of the city) and stretching along the coastline. These huge gardens were let in 1404 to the noble family of the Argyropouloi at an annual rent of 30

105–8.

[6] See H.-V. Beyer, "Der 'Heilige Berg' in der byzantinischen Literatur," *JÖB* 30 (1981): 171–205; A. R. Littlewood, "Gardens of Byzantium," *Journal of Garden History* 12 (1992): 144; L. Brubaker and A. R. Littlewood, "Byzantinische Gärten," in *Der Garten von der Antike bis zum Mittelalter,* ed. M. Carroll-Spillecke (Mainz am Rhein, 1992), 245.

[7] Akropolites, ed. Heisenberg, 1:66.8.

gold coins. The Argyropouloi were also obliged to provide for the needs of the monastery adequate amounts of produce from the gardens; among the items mentioned in the document are cabbages, leeks, carrots, garlic, onions, courgettes, melons, and cucumbers as well as pomegranates. The Argyropouloi profitably exploited the property, expanded the cultivated land, improved the irrigation, and hired out the gardens to a number of gardeners, whose names are given in the document, and thus they earned much more than the annual rent they paid to the monastery. This caused disagreement with the monastery, whose monks took the case before the court in Thessalonike and even to Emperor Manuel II Palaiologos himself in 1421. The emperor ordered his son in Thessalonike, the despot Andronikos, after hearing the views of the Argyropouloi, to return the gardens to the monastery. The fate of these gardens, which seem to have supplied Thessalonike with fresh vegetables for many years, cannot be followed after 1430, when the Ottomans stormed into the city and carried away most of its citizens.[8]

The Athonite *praktika* mention not only many other *kepoi* in the area of eastern Macedonia and Chalkidike that the monasteries had acquired through donation or purchase, but also water mills used in irrigating the gardens. These registers of land also refer to the small gardens or kitchen gardens owned by most families living in villages whose land belonged to the Athonite monasteries. We know the types of trees grown in these gardens—and almost every household could boast at least one tree. The following are mentioned: fig, walnut, pear, cherry, quince, almond, apple, pomegranate, olive, chestnut, mulberry, and oak. The great number of vineyards mentioned in these documents indicates that the area was well cultivated and productive. The same trees are cultivated today in the area of Chalkidike, evidence that few changes have occurred in both the farming habits and the climate of this area, at least before the introduction of mechanized agriculture.[9] One suspects, but cannot, of course, prove, that in these gardens the instructions given in the *Geoponika* (which was preserved mostly through late Byzantine manuscripts) for cultivating flowers beneath the trees were often followed.[10]

From the Peloponnese there survives a fifteenth-century description by the churchman John Eugenikos of the village of Petrina, east of Sparta. Eugenikos speaks of the

[8] For a recent edition of these documents, see *Actes d'Iviron,* vol. 4 (Paris, 1995), 1: nos. 97–98, 151–64. Document no. 98 is a σεκρετικὸν γράμμα of the *katholikoi kritai* of Thessalonike of April 1421 (text, 158–62, pls. xxxii–xxxiv), while no. 99 (text, 164, pl. xxxv) is a *prostagma* of Emperor Manuel II of June 1421. The first, acephalous, document was also published by Ioakeim Iberites in *Gregorios Palamas* 5 (1921): 846–51, and by F. Dölger, *Aus den Schatzkammern des Heiligen Berges, Textband* (Munich, 1948), no. 102, 263–72 (text, 266–69). The second document was also published by Ioakeim Iberites in *Gregorios Palamas* 1 (1917): 541–42, and by Dölger, *Schatzkammern,* no. 24, 69–71 (text, 70). For the gardens owned by this monastery in Thessalonike, see *Actes d'Iviron,* vol. 3, *De 1204 à 1328,* Archives de l'Athos 18 (Paris, 1994), no. 76, 240.60–62 and no. 84, 299.3–4 and 300.27. For literature on the disputes over these gardens, see Littlewood, "Scholarship."

[9] Cf. A. Laiou-Thomadakis, *Peasant Society in the Late Byzantine Empire: A Social and Demographic Study* (Princeton, N.J., 1977), 32; improved Greek trans. (Athens, 1992), 47–51.

[10] Τὸ δὲ μεταξὺ τῶν δένδρων πληρούσθω ῥόδων καὶ κρίνων καὶ ἴων καὶ κρόκου, ἃ καὶ τῇ ὄψει καὶ τῇ ὀσφρήσει καὶ τῇ χρήσει ἐστὶν ἥδιστα καὶ εὐπροσόδευτα, καὶ ταῖς μελίσσαις ὠφέλιμα. *Geoponika,* ed. H. Beckh (Leipzig, 1895), 10.1.264.3–6.

picturesque landscape, since the village was close to the sea but also to a lake, where forest trees were mixed with fruit trees and the land was covered by vineyards and olive, fig, pear, pomegranate, apple, and oak trees. All these together created a healthy climate. He adds that as one went lower in the plain, there were natural springs, green bushes, meadows, and a variety of flowers.[11]

The capital itself had suffered much under the Latin occupation of 1204–61, but in a public speech delivered before the emperor, perhaps in 1266, Manuel (monastic name Maximos) Holobolos records what Michael VIII Palaiologos had done in the way of restoration.[12] He mentions the fertile land and the rivers and refers to improvements in the cultivated fields, the ports, the many beautiful parks, the fountains in public places, and the watered meadows, where all kinds of plants and a great variety of flowers, which had been neglected for many years, were now flowering to such a degree that they could be compared with the Homeric gardens of Alkinoos.[13] This is partly a rhetorician's license, but we do know of a number of specific vegetable gardens, vineyards, orchards,[14] and other cultivated land toward the end of the fourteenth and the early fifteenth century, when the city was blockaded by the Ottomans and there was a shortage of food. These gardens and vineyards were mostly owned by monastic communities, but were worked by laymen who did not always fulfill their obligations to the monasteries. We thus obtain useful information on them from the documentation of a number of cases that were brought before the patriarchal synod.[15]

Further east at Nicaea, where John III Vatatzes is known to have taken a great interest in farming,[16] his successor, Theodore II Laskaris, composed an encomium of the city ca. 1250 before his own accession. In it he describes the many vineyards and other plantations and the bountiful supply of water and springs in the surrounding area.[17] Some forty years

[11] Ed. S. P. Lampros, Παλαιολόγεια καὶ Πελοποννησιακά, vol. 1 (Athens, 1912–23), esp. 49–55.

[12] Ed. M. Treu, *Manuelis Holoboli Orationes,* vol. 2, Programm des Königlichen Victoria-Gymnasiums zu Potsdam, Ostern (Potsdam, 1907), 57.29–59.5. On Michael's work of restoration, see also *Georgii Cyprii Laudatio Michaelis Palaeologi,* PG 142:376B–377D; Failler-Laurent, *Pachymérès,* 3.2:233.8–11; Nikephoros Gregoras, *Byzantina historia,* ed. L. Schopen and I. Bekker, 3 vols. (Bonn, 1829–55), 1: 88.12–16 (hereafter Gregoras [Bonn ed.]). See also Macrides, "The New Constantine and New Constantinople—1261?" *BMGS* 6 (1980): 13–41, and Talbot, "The Restoration of Constantinople under Michael VIII," *DOP* 47 (1993): 243–61.

[13] For Alkinoos' gardens, see Homer, *Odyssey,* 7.112–32.

[14] For the fruit grown in Demetrios Kydones' garden, see below, pp. 99–100.

[15] See MM, 2:497–99 (garden and cultivated land in the area of Kynegos, A.D. 1400); 499–501 (vineyard owned by Theotokos Pausolype in 1401); 501–2 (garden owned by the nunnery of Magistros in 1401); 506–9 (vineyard and plot of land cultivated with wheat owned by the monastery of St. Andrew in Krisei in 1401); 543–46 (*peribolion,* A.D. 1401); 557–58 (vineyard in the area of St. Romanos, A.D. 1401).

[16] Theodore Skoutariotes (Akropolites, ed. Heisenberg, 1:285–87); Gregoras (Bonn ed.), 1:2.6, 42.1–8.

[17] *Theodori II Lascaris imperatoris in laudem Nicaeae urbis oratio,* ed. L. Bachmann (Rostock, 1847), 8.2–10.1; for a new edition of the text, see Sophia Georgiopoulou, "Theodore II Dukas Laskaris (1222–1258) as an Author and an Intellectual of the XIIIth Century" (Ph.D. diss., Harvard University, 1990), 140–72, esp. 156.169–163.238. The encomium also appears, together with an English translation by J. Tulchin and C. Foss and a brief commentary by the latter, in C. Foss, *Nicaea: A Byzantine Capital and Its Praises* (Brookline, Mass., 1996), 132–63, esp. 140–45.

later the youthful Theodore Metochites delivered an encomium of the city before the visiting emperor Andronikos II, in which he speaks of the rivers watering the surrounding fertile plain where vineyards and other trees were planted.[18]

Similar descriptions survive of the neighborhood of independent Trebizond in two mid-fifteenth-century encomiasic ekphraseis. Its native son Bessarion, probably shortly before becoming a cardinal in 1439, expatiates on the flowery suburbs, meadows (λειμῶνες), and pleasure gardens (παράδεισοι) full of all kinds of fruit trees, including a large number of olive trees that provided shade in many places.[19] John Eugenikos, paying a visit to his father's birthplace, more briefly praises the view of the city from the sea: "the eyes discover a delightful and splendid view of plains and pleasant meadows, a variety of flowers, extensive woods, and gentle mountains, green bushes and grass, planted vineyards and many other shrubs and cypress trees, which sway as if they were dancing."[20]

There is no evidence to suggest that the legislation concerning the everyday life of those working farms and gardens had changed in the late Byzantine period, and it seems that the "Farmer's Law" (of possibly 7th-century origin) continued to provide the legal solutions to their problems. This collection contains specific references to gardens. The first (chap. 31) refers to the protection of the garden affected by the shadow of a tree, whose owner is ordered to prune its branches. The other two (chaps. 50, 51) refer to the accidental killing of an animal that tries to enter a garden.[21] The "Farmer's Law" influenced later legal texts. These included the "Hexabiblos" of the lawyer Constantine Harmenopoulos, which was composed in Thessalonike ca. 1345 to serve as an epitome of the Byzantine legal system. The "Hexabiblos" contains a chapter referring to the gardens or orchards and other plantations in which it is stipulated that a distance of at least 50 feet must separate an existing garden from a new building.[22]

Public Parks

For convenience, pleasure gardens may be subdivided into public parks, imperial gardens, and private gardens in urban houses of the aristocracy, although all three bear many similarities to each other. The fullest information on any public park comes from just before our period. It is contained in the description of the church of the Holy Apostles in

[18] Ed. K. Sathas, Μεσαιωνικὴ Βιβλιοθήκη, vol. 1 (Venice, 1872), 143 (hereafter MB). The text is reprinted with an English translation by Tulchin and Foss in Foss, *Nicaea,* 172–75.

[19] "Βησσαρίωνος Ἐγκώμιον εἰς τὴν Τραπεζοῦντα," ed. S. P. Lampros, Νέος Ἑλλ. 13 (1916): 145–204, text 146–94; see esp. 154, 167, 185–87, 188–90.

[20] "Ἰωάννου Εὐγενικοῦ, Ἔκφρασις Τραπεζοῦντος," ed. O. Lampsides, Ἀρχ.Πόντ. 20 (1955): 3–39, text, 25–36; see esp. 32.126–33.130. This evidence is corroborated by Pero Tafur, who visited Trebizond at the end of 1437 and reported, "Trebizond has about 4,000 inhabitants. It is well walled, and they say that the ground is fruitful and that it produces a large revenue" (Tafur, *Travels,* 131).

[21] See I. and P. Zepos, *Jus Graecoromanum,* vol. 2 (Athens, 1931), 67, 68, 69; cf. also G. E. Heimbach, ed., *Constantini Harmenopuli, Manuale Legum sive Hexabiblos, cum Appendicibus et Legibus Agrariis* (Leipzig, 1851), 840.5, 6 and 846.2.

[22] Cf. Harmenopoulos, Πρόχειρον Νόμων ἢ Ἑξάβιβλος, ed. C. G. Pitsakes (Athens, 1971), 2:4.48, 128–29.

Constantinople that was composed between 1198 and 1203 by Nicholas Mesarites.[23] However, it is perhaps reasonable to assume that Michael VIII Palaiologos, who spent many of the funds available in the imperial treasury to restore the prestige of his recovered capital, took special care of the church of the Holy Apostles and its surrounding gardens,[24] for it was there that he erected a column with a bronze statue of himself offering a model of the city to his namesake the Archangel Michael[25] to celebrate his restoration of the capital. The speech of Holobolos referred to above[26] further corroborates this belief since the orator specifically mentions parks among Michael's improvements. Mesarites' description, therefore, despite his literary borrowings,[27] may substantially give us an idea of the parkland as it was in the 1260s and 1270s. He tells us that there were water reservoirs here able to supply the whole city and also a great variety of fruit trees and splendid gardens where balsam, lilies, fresh clover and hyacinth, roses, oleander, and many other plants of sweet aroma were cultivated. Aqueducts and a variety of springs, tall trees, and musical birds added to the pleasure of the environment.

One cannot expect great concern for public parks and gardens or for the pleasure gardens of the capital during the last century of hardship. Manuel Chrysoloras, in a long letter from Rome, where he was residing as teacher of Greek and ambassador of the emperor, to the prince and future emperor John VIII Palaiologos early in the fifteenth century, does indeed find that New Rome resembles the Old Rome like a daughter resembles her mother, for the former is more beautiful with numerous monuments and statues, great buildings and churches, colonnades and cisterns, strong walls but also fruit trees and many suburbs on both the European and Asiatic shores. However, Chrysoloras was being rather nostalgic, presenting an ideal picture of his home city; the decline of Constantinople began in the fourteenth century, and many of its inhabitants had fled during the lengthy blockade of Bayezid I from 1394 to 1402.[28] A few years after Chrysoloras' letter, Pero Tafur reported

[23] "Nikolaos Mesarites: Description of the Church of the Holy Apostles at Constantinople," ed. and trans. G. Downey, *TAPS,* n.s., 47 (1957): 853–924, esp. 897, 3.4, 5, 6 (trans., 863).

[24] See Failler-Laurent, *Pachymérès,* 2:33, 221.17–223.8.

[25] The church and this remarkable bronze statue were severely damaged by the earthquake of 1 June 1296: the archangel lost his head and the model of the city slipped out of the emperor's hands and also fell to the ground. See Pachymeres, ed. Bekker, vol. 2:234.13–22, with English translation in C. Mango, *The Art of the Byzantine Empire, 312–1453* (Toronto-Buffalo-London, 1986; 1st ed., 1972), 245–46 and n. 9. The statue seems to have been restored and was seen there by Buondelmonti in 1420; see G. Gerola, "Le vedute di Costantinopoli de Christoforo Buondelmonti," *SBN* 3 (1931): 275–76.

[26] See above, note 12.

[27] Littlewood ("Gardens of Byzantium," 144) has shown that Mesarites, in this work, imitated Libanios' *Antiochikos.* It seems, however, despite the stylistic imitation and even the verbatim copying of certain phrases, that the gardens and the surroundings of the church of the Holy Apostles were at least real.

[28] Text of the letter in PG 156:23–54 with a Latin translation (a small passage is translated into English by Mango, *Art of the Byz. Empire,* 250–52); see also E. Fenster, *Laudes Constantinopolitanae* (Munich, 1968), 234–38. Already in the 1330s the aristocratic historian Nikephoros Gregoras criticized Emperor Andronikos III for paying no attention to ceremonial and neglecting the restoration of the luxurious imperial palace as well as the churches and other buildings; see Gregoras (Bonn ed.), 1:566.19–568.17, esp. 568.8–17. On the condition of Constantinople ca. 1400 there survives a patriarchal document (ed. MM, 2:463–67, esp. 463–64) referring to τοσαύτην ἡμῖν θλίψιν καὶ κάκωσιν ἐπενεχθῆναι καὶ τὴν ἐρήμωσιν καὶ ἀμορφίαν πάσης σχεδὸν τῆς

more accurately on the condition of Constantinople when in 1437/38 he observed that the dilapidation of the city was indicative of "the evils which the people have suffered and still endure."[29]

There are hints that the inhabitants of Nicaea enjoyed parks while it was the capital and for some time thereafter. Theodore II Laskaris, in the encomium mentioned earlier,[30] claims that it so abounded in trees that anyone approaching the city might have confused it with a grove and, coming closer, have thought it a "paradise," while on entering might have said that it was a city of the Graces, since cypress trees projected above the towers of its fortifications (Fig. 2). Again, ca. 1290 Metochites praised the city's many public baths, fountains, and churches, such as that of St. Tryphon, whose feast was celebrated at the time when flowers in the city were blooming.[31] The two descriptions of Trebizond by Bessarion and Eugenikos quoted above[32] also suggest the possibility of public parks (as well as privately owned pleasure gardens) in that city.

Imperial Gardens

During the Latin occupation of Constantinople, the Nicaean emperor John III Vatatzes created gardens at his summer palace outside Nymphaion.[33] In fact it is in these gardens that he died in November 1254.[34] Praise of the palace, the excellent climate, the meadows, and the flowing springs of the area is to be found in an encomium of Emperor Michael VIII Palaiologos by Manuel Holobolos, delivered after the recovery of Constantinople ca. 1265.[35] The palatial gardens at Nymphaion may also figure in an *epithalamion* by the otherwise unknown poet Nicholas Eirenikos. This was composed for the wedding of John III and Constance (called Anna by the Byzantines), daughter of the German emperor Frederick II and Bianca Lancia, which took place in 1244. In part 4 of the poem the emperor is compared to a lotus and the bride to a beautiful rose, while the ceremony takes place in a meadow that may well have belonged to the summer palace.[36]

Although Manuel Philes, court poet under Andronikos II and III in the first half of the fourteenth century, left among his compositions on flora[37] and fauna no description of an actual palace garden, he did write a long poem of 108 verses referring to a garden painted

μεγαλοπόλεως ταύτης.

[29] Tafur, *Travels,* 145–46.

[30] Above, note 17, esp. 8.5–12.

[31] Sathas, MB 1:147–48.

[32] Above, p. 92, notes 19, 20.

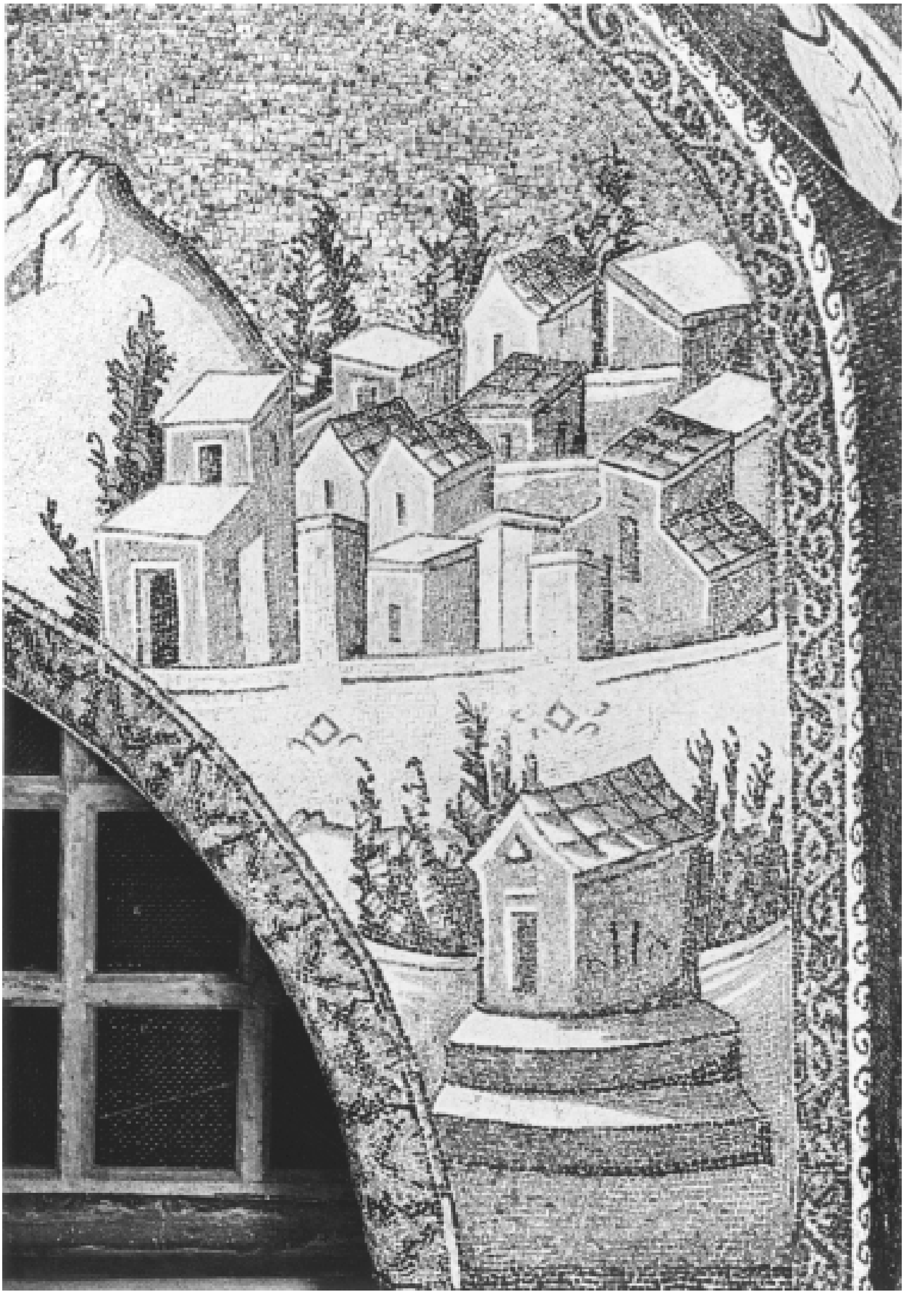
[33] On imperial gardens in general, see A. R. Littlewood, "Gardens of the Palaces," in *Byzantine Court Culture from 829 to 1204,* ed. H. Maguire (Washington, D.C., 1997), 13–38.

[34] Akropolites, ed. Heisenberg, 1:103.11–19.

[35] Treu, *Manuelis Holoboli Orationes,* 1:48.28–32.

[36] Ed. A. Heisenberg, "Aus der Geschichte und Literatur der Palaiologenzeit," *Sitzungsberichte der Bayerische Akademie der Wissenschaften, Philosophisch-philologische und historische Klasse* (Munich, 1920), 10, 103.80–104.92.

[37] E.g., four verses praising a white rose sent as a cover poem accompanying the rose to a high-standing friend from whom Philes was probably asking a favor; see *Manuelis Philae Carmina,* ed. E. Miller, 2 vols. (Paris, 1855–57), 1:no. CLII, 341.



2 Istanbul, monastery of Chora, present-day Kariye Camii. Mosaic, Return of the Holy Family from Egypt, detail of Nazareth (photo: after P. A. Underwood, *The Kariye Djami* [New York, 1966], 2:203, pl. 111)

on the ceiling of an imperial palace. The poem takes the form of introductory questions posed by a visitor admiring the painted ceiling, and the poet, while answering his queries, presents a nice picture of the garden to the reader. The poet admires the garden hanging from the ceiling, which, though not watered, has branches of fresh trees, full of leaves and flowers. Next to the lilies are the colors of a beautiful grove. So lifelike is it all that he wants the visitor to avoid touching or cutting the lilies. The painter has shown himself to be an excellent guardian of the grove and has depicted predatory animals pursuing other animals, such as hares, which feed on herbs; occasionally, too, a bird perches in the hollow of a lily, gathering the seed of the flower. He has painted a female lion feeding her cubs, and a pair of peacocks, but has banished the noisier birds, such as swallows, nightingales, and swans, to avoid disturbing the silence obligatory in an imperial chamber.[38]

A second ekphrasis by John Eugenikos describes a royal couple in an imperial garden whom he seems to have observed from the galleries of the palace above. He gives us valuable information about this garden in the fifteenth century. The newly married couple had walked out of the palace into the garden, and they were surrounded by trees, such as apple, pear, and citrus, and also by vineyards and flowers, such as red and white roses, hyacinths, narcissi, violets, and lilies. There was also a very pretty fountain with a golden dove and flowing water.[39] Whether John Eugenikos refers to a real or an imagined garden we cannot tell, but his description is very vivid, and he may well refer to an event that he had observed in the palace after a royal wedding.[40]

Elements that appeared in descriptions of imperial (and other) gardens before the sack of 1204 may be found in Palaiologan romances and in a long ekphrasis by the early fourteenth-century teacher of rhetoric Theodore Hyrtakenos on the pleasure garden of St. Anne,[41] as is well demonstrated by Mary-Lyon Dolezal and Maria Mavroudi.[42]

Imperial enthusiasm for hunting in the middle Byzantine period resulted in the creation of game parks outside the capital.[43] There is no clear evidence that any of these

[38] Ibid., 2: no. LXII, 127–31. The poem is partly translated into English by Mango, *Art of the Byz. Empire,* 248. Cf. Littlewood, "Gardens of Byzantium," 147–48, and "Gardens of the Palaces," 34; also Nancy P. Ševčenko, "Wild Animals in the Byzantine Park," in this volume. In another poem, "On the Twelve Months," Philes, in referring to May, speaks of the blossoms in the capital (ed. Miller, 1:341–42; also ed. I. L. Ideler, *Physici et Medici Graeci Minores,* vol. 1 [Paris, 1841], 290–91. Cf. a similar poem attributed to Theodore Prodromos [ed. Ideler, ibid., 1:418–20]).

[39] Ῥῆγες ἐν παραδείσῳ, ed. J. F. Boissonade, *Anecdota Nova* (Paris, 1844; repr. Hildesheim, 1962), 340–46, esp. 342, 345.

[40] If the persons are real, he may well be referring to the second wedding of John VIII Palaiologos and Sophia of Montferrat, which took place in the capital on 19 January 1421 and was followed by the coronation of John as co-emperor. See D. M. Nicol, *The Last Centuries of Byzantium, 1261–1453,* 2d ed. (Cambridge, 1993), 330–31.

[41] Ed. J. F. Boissonade, "Ἔκφρασις εἰς τὸν Παράδεισον τῆς Ἁγίας Ἄννης τῆς μητρὸς τῆς Θεοτόκου," *Anecdota Graeca,* 5 vols. (Paris, 1829–33; repr. Hildesheim, 1962), 3:59–70.

[42] "Theodore Hyrtakenos' *Description of the Garden of St. Anna* and the Ekphrasis of Gardens," in this volume. Mention should also be made of a brief description by Emperor Manuel II Palaiologos of a handmade embroidery depicting spring scenery, which he had seen in the palace of King Charles VI in Paris (PG 156:577–80).

[43] See Littlewood, "Gardens of the Palaces," 35–38; H. Maguire, "Imperial Gardens and the Rhetoric of

survived the Latin conquest, although there seems to have been little abatement of imperial interest: the locations of the hunts mentioned may have been simply the countryside surrounding the city.[44]

Private Gardens in Urban Houses of the Aristocracy

Little is known about the private houses of the aristocracy in the cities, and archaeology can offer little help in the case of Constantinople and Thessalonike, the largest cities of the empire, since the modern cities are built above the medieval ones. Nonetheless, written sources sometimes give us limited information about the palaces of the wealthy, which in certain cases it is hard to imagine did not possess gardens;[45] and even in the parlous conditions of the fifteenth century, aristocrats were still constructing for themselves luxurious three-storey houses in Constantinople that presumably often had attached gardens.[46]

One house, however, is well attested, the palace of Theodore Metochites, which was looted by the followers of Andronikos III Palaiologos when he took over the capital in May 1328. Nikephoros Gregoras, who mentions the event, says that even the soil from this famous Constantinopolitan palace was sent as a present to the ruler of the Skythians. From exile Metochites himself vividly refers in a poem to his house, which possessed a chapel with many-colored marbles and a bath. There were also gardens of delightful beauty and ever-flowing fountains and a courtyard surrounded by a portico sheltered from the rays of the sun, where Metochites delighted in taking walks (he had even reconstructed the road

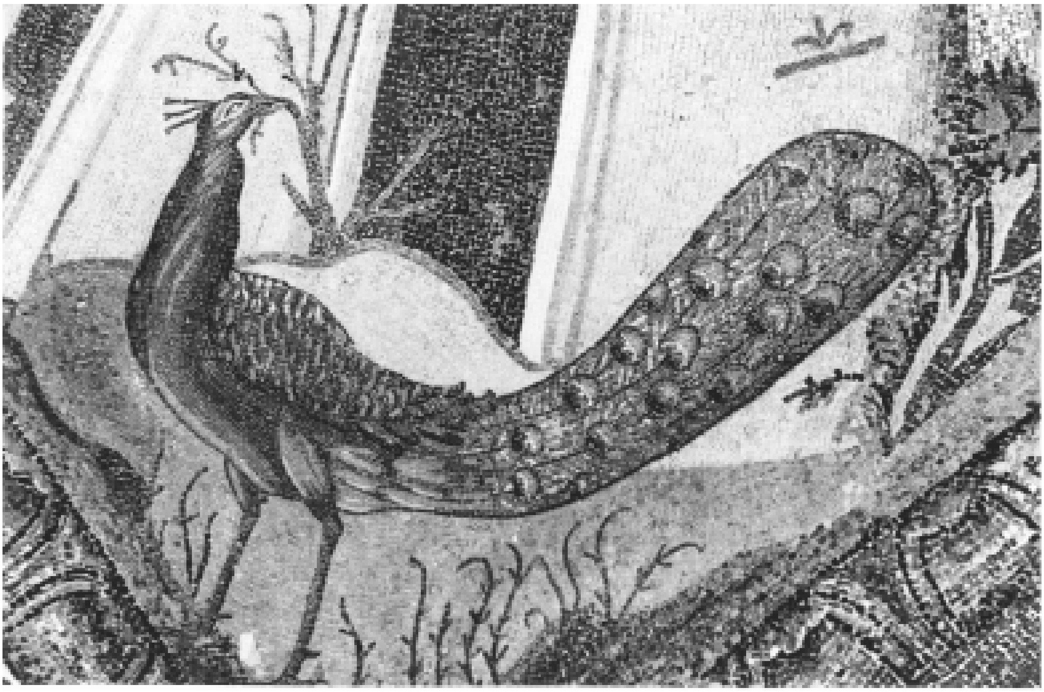
Renewal," in *New Constantines: The Rhythm of Imperial Renewal in Byzantium, 4th–13th Centuries,* ed. P. Magdalino (Aldershot, 1994), 181–97; and Nancy P. Ševčenko, "Wild Animals," above, 69–86.

[44] Emperor Andronikos III Palaiologos (1328–41) became famous for his hunting expeditions, for which he kept a great number of hunting dogs and hunting birds, whose upkeep cost an annual sum of 15,000 gold coins (Gregoras [Bonn ed.], 1:11, 566.4–12). Pero Tafur, who arrived in Constantinople in the autumn of 1437, two weeks before John VIII Palaiologos departed for the West to attend the Council of Ferrara, accompanied the emperor on hunting expeditions outside Constantinople. Once when they were joined by the empress, he reports that they killed many hares, partridges, francolins, and pheasants, which were very plentiful (Tafur, *Travels,* 118, 124). The same emperor also invited Ciriaco di Ancona to take part in a hunting expedition outside Constantinople together with the Genoese podestà Boruelo Grimaldi and his son in July 1444 (see J. Colin, *Cyriaque d'Ancône: Le voyageur, le marchand, l'humaniste* [Paris, 1981], 355–56). John had indeed been promised by his father, Manuel II, a horse of noble origin, a hunting dog, and a hunting bird when he reached adolescence (PG 156:313B).

[45] For instance, the late 13th-century house owned by the grand logothete Constantine Akropolites, which had an enclosed interior with a private chapel and a study (the evidence is to be found in a letter addressed to his brother, the monk Melchisedek, after the severe earthquake of 1 June 1296; ed. C. N. Constantinides, *Higher Education in Byzantium in the Thirteenth and Early Fourteenth Centuries, 1204–ca. 1310* [Nicosia, 1982], 163–64, no. 59, lines 31–39). Other examples are probably the wealthy two-storey house with a front courtyard of the future emperor John Kantakouzenos, which was confiscated by the state in 1341 (Kantakouzenos, *Historiarum,* ed. L. Schopen, 3 vols. [Bonn, 1828–32], 2:137.8–11, 164.21–165.12), and the well-known tower-house, called *Epivatai,* built outside the walls of Constantinople on the European shore of the Bosporos by Alexios Apokaukos ca. 1340 when he was *parakoimomenos* to Andronikos III Palaiologos (Kantakouzenos, 2:70.24–71.2; Gregoras [Bonn ed.], 2:585.10–22; 602.14–603.3).

[46] They were blamed by Joseph Bryennios in 1416 for doing this while paying no attention to the restoration of the city walls; see N. B. Tomadakes, Περὶ ἁλώσεως τῆς Κωνσταντινουπόλεως *(1453),* 2d ed. (Athens, 1969), 249.180–84.

3 Istanbul, monastery of Chora, present-day Kariye Camii. Mosaic, the Annunciation to St. Anne, detail of well



4 Istanbul, monastery of Chora, present-day Kariye Camii. Mosaic, the Virgin Caressed by Her Parents, detail of peacock in southeastern pendentive (photo: after Underwood, *Kariye Djami*, 2:117, pl. 90)

leading to this house).[47] In the narthex of the monastery of the Chora, which he had refounded and lavishly decorated, the garden with a fountain in the mosaic of the Annunciation to St. Anne may well be a reminiscence of his private garden (Fig. 3). The representation in a nearby mosaic of peacocks in Joachim's garden, besides their symbolic role, may similarly have been intended to remind him of peacocks adorning his own paradise (Fig. 4).[48]

It is unclear whether another property belonging to a slightly later statesman was a separate orchard or a garden adjoining his house.[49] Demetrios Kydones mentions in one of

[47] There are two incomplete editions of this poem (no. 19): one by R. Guilland, "Le palais de Théodore Métochite," *REG* 35 (1922), 86–93, with a French translation, and, more recently, by Eva de Vries-van de Velden, *Théodore Métochite: Une réévaluation* (Amsterdam, 1987), 253–57; see also I. Ševčenko and J. Featherstone, "Two Poems by Theodore Metochites," *GOTR* 26 (1981): 1–46. For the looting of the house, see Gregoras (Bonn ed.), 1:425.11–426.10, 458.23–459.2, 459.18–24. There is also a new complete edition of Metochites's poem 19: *Theodore Metochites's Poems "To Himself,"* ed. and trans. J. M. Featherstone, Byzantina Vindobonensia 23 (Vienna, 2000), 112–31, esp. 118.155–123.239.

[48] For fountain, trees, peacocks, and partridge, see P. A. Underwood, *The Kariye Djami,* vol. 2 (New York, 1966), scenes 84–85, 88–91, 96, 98–101, 107, 110–12, 115–16, 134–35, 137, 141.

[49] Kydones refers to it here and elsewhere in his letters as a γήδιον ("little piece of land") and himself as a γεωργός ("worker of the land"), but, as elsewhere, his letter is gently ironic, while γεωργός can bear the meaning of "gardener" rather than "farmer."

his letters (dated ca. 1374–75) to his patron, the empress Helena Kantakouzene Palaiologina, that he sent her medlar fruits from his own garden. Kydones claims that he himself cultivated his garden but, because his medlars were famous for their sweetness, the emperors had ordered him to send the fruit to them. Very charmingly Kydones adds that "although I swore to obey the emperors in all things by day, at night I exercise my rights, and, stealing my own fruit, I taste it and send some to those to whom it is right to send it, before sending it to the emperors."[50]

Conclusion

The love for trees and nature, for the garden and the flower, has always been part of human culture. The Byzantines inherited from antiquity this appreciation and made it part of their own Greco-Roman and Christian culture.[51] Byzantine emperors took special care for the upkeep of Constantinople and other important cities by founding public buildings that were sometimes surrounded by gardens. Public parks also existed either within or in the vicinity of the capital. Likewise individuals took pride in having small pleasure or kitchen gardens. Those who could afford to do so created for their own delight a larger *paradeisos*, an enclosed garden in imitation of the garden of Eden. Finally, although we have inadequate information, it appears that those who continued until the fifteenth century to copy and study the *Geoponika* and Dioskourides and to prepare drawings of the various plants, and to write poems on flowers or rhetorical ekphraseis on gardens, represent the continuity of a garden culture that was preserved in the east until the end of the Byzantine Empire. In Constantinople in the spring of 1453, when the great city was destroyed by the heavy artillery of the Ottoman Turks and looted by the illiterate soldiers of Mehmet II, the flowers were blooming and the fruits were ripe for picking by the hands of another culture. But even this was not the end, for the Turks themselves began to replant the gardens,[52] and admiration of the splendor of the city and the persistence of ideals in the Greco-Roman tradition had already traveled from the city to reach Italy.

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[50] *Démétrius Cydonès, Correspondance,* ed. R.-J. Loenertz, 2 vols., Studi e Testi 186 and 208 (Vatican City, 1956–60), letter 143; English translation by F. Kianka, "The Letters of Demetrius Kydones to the Empress Helena Kantakouzene Palaiologina," *DOP* 46 (1992): 160. For further gifts of fruit by Kydones, see letters 81, 186, 295, 296, 424, and (possibly) 405; and for a gift of roses to John V Palaiologos, letter 233.

[51] An example that typifies the Byzantine delight in the natural world, whether wild or tended by human hands, is afforded by the historian Nikephoros Gregoras, who in an introduction to the disastrous expedition of Andronikos III against the Ottomans in 1329 cannot help remarking that "the time had already come when the hands of spring give birth to plants and paint the earth with the varied colors of grass, offering much pleasure to the eyes of human beings" (Bonn ed., 1:9.9, 433.9–11).

[52] For the building of palaces and gardens in Constantinople after its capture by the Ottoman sultan Mehmet II and the eparch of Europe Machmout, see *Critobuli Imbriotae Historiae*, ed. D. R. Reinsch (Berlin–New York, 1983), 131.25–133.7, esp. 133.1–4.

Appendix

Information on Gardens and Their Produce in Proverbs

Unlike the other sources used for this survey of late Byzantine gardens, proverbs are notoriously difficult to date and usually impossible to link with any historical situations. They may generally be divided into two categories: those in the "high" language and those in the "low" or demotic. The former were collected by classicizing scholars or teachers of rhetoric and are frequently related to or extracted from ancient Greek and Hellenistic literature or refer to ancient Greek myths; most are to be found in Byzantine lexica and especially in the encyclopedic compilation of the tenth century known as the *Souda*. The latter represent the wisdom of the Greek-speaking population of Byzantium, and many of these proverbs have passed into Modern Greek and are in use even today.[1] The justification for presenting such information in this Appendix is twofold. First, most of the proverbs adduced here come from compilations made during the late Byzantine period by Gregory II of Cyprus, patriarch of Constantinople (1283–89), Makarios Chrysokephalos, metropolitan of Philadelphia (1336–82), and the mid-fifteenth-century teacher, writer, and copyist Michael Apostoles.[2] Therefore, the frequency with which trees and flowers especially figure in these proverbs may reflect the importance of gardens to the Byzantines at this time. Second, paroemiographers have hitherto been ignored by historians of Byzantine gardens. It must be noted, however, that what follows is far from an exhaustive survey of information pertaining to gardens, flowers, trees, and vegetables preserved in even the published collections of proverbs (some of the demotic have still not been printed).[3]

Gardens in General

Illusory pleasure is indicated with reference to the gardens of Adonis[4] or Tantalos,[5] while a flowering garden is compared to the garden of Alkinoos[6] or even to those of Zeus.[7]

[1] On Byzantine demotic proverbs, see in general H.-G. Beck, *Geschichte der byzantinischen Volksliteratur* (Munich, 1971), 206–7 (Greek trans. with additions, 2d ed. [Athens, 1993], 317–19), with references to editions; Ph. I. Koukoules, Βυζαντινῶν βίος καὶ πολιτισμός, vol. 6 (Athens, 1955), 336–51. See now Th. Papadopoullos, "Προλεγόμενα εἰς τὸν παροιμιακὸν λόγον," Μελέται καὶ Ὑπομνήματα 2 (Nicosia, 1991), 1–93.

[2] The following abbreviations are used in the notes to this Appendix: G. of C. = Gregory of Cyprus; Chrys. = Makarios Chrysokephalos; Apost. = Michael Apostoles; *Corpus* = E. L. Leutsch, *Corpus Paroemiographorum Graecorum,* vol. 2 (Göttingen, 1851; repr. Hildesheim, 1965).

[3] See, for instance, a collection preserved in Paris, B.N. gr. 947, fols. 271r–273r, A.D. 1574.

[4] Ἀδώνιδος κῆποι: Ἐπὶ τῶν ὀλιγοχρονίων καὶ ἀώρων (G. of C., PG 142:445: similar version in *Corpus,* 132.5–6); cf. also Ἀκαρπότερος Ἀδώνιδος κήπου· ἐπὶ τῶν μηδὲν γενναῖον τεκεῖν δυναμένων (Chrys., *Corpus,* 140.20–21) and the lengthier version in Apost. (*Corpus,* 247.19–24). It is worth observing that hanging gardens were called Ἀδώνειοι because they were temporary: Ἀδώνειοι καρποὶ λέγονται οἱ μετέωροι κῆποι (*Souda,* 1:53.15, no. 514 [ed. A. Adler, 5 vols. (Leipzig, 1928–38)]: cf. ibid., 53.21–24, no. 517; 76.27–28, no. 807 and Apost., loc. cit.).

[5] Ταντάλου κῆπον τρυγᾷς ἐπὶ τῶν μάταια ποιούντων (Apost., *Corpus,* 656.1–2; cf. idem, *Corpus,* 657.10–17; *Souda,* 4:501.14–20, no. 80; 507.12–19, no. 147).

[6] For the gardens of Alkinoos, see above, note 13, and Treu, *Manuelis Holoboli Orationes,* 2:58.15.

[7] Ἐν Διὸς κήποις ἀροῦσθαι μόνον εὐδαίμονας ὄλβους (Apost., *Corpus,* 399.20–21).

Flowers

The royal flower for the Byzantines was the rose, which came in many varieties of color, fragrance, and foliage (e.g., *triakontaphylla, hexēkontaphylla, hekatomphylla*).[8] Vanity and the temporal nature of beauty are compared with an old or dying rose;[9] the inequality of things is shown by the comparison of a rose and an anemone;[10] happy news is received like roses.[11]

Trees

The strongest or the royal tree is the oak, and this tree is used in proverbs with various meanings: even an oak finally succumbs when continuously struck;[12] the fall of a high personage that may benefit many is compared with the falling of a big oak tree.[13]

The wood of the fig tree, which breaks easily, was used to refer to weak assistance or to the weakness of a person in general,[14] but the fig fruit itself was always synonymous with integrity, honesty, and truth.[15]

Silence and negligence abroad were linked with the lotus;[16] infertility could be suggested by the fruit of the cypress tree,[17] luxury gifts by the apples of the Hesperides,[18] and ambition by a garland of myrtle.[19]

Vegetables

Vegetables appear more rarely in proverbs, but cabbages, onions, and garlic had a very low value. Thus poor reinforcements were referred to as cabbage additions,[20] or a person

[8] On roses, see Beckh, *Geoponika,* 11.18, 336–38.

[9] Ῥόδον παρελθὼν μηκέτι ζήτει πάλιν· ἐπὶ τῶν κυδαινόντων τινάς (*Souda* 4:297.11–12, no. 203; cf. G. of C., PG 142:465 and *Corpus,* 86.8–9; Apost., *Corpus,* 635.5–7).

[10] Ῥόδον ἀνεμώνῃ συγκρίνεις· ἐπὶ τῶν ἀνόμοια συμβαλλόντων (*Souda,* 4:297.8–9, no. 203; G. of C., *Corpus,* 86.10–11; Chrys., ibid., 207.1–2; Apost., ibid., 635.1–2).

[11] Ῥόδα μ᾽ εἴρηκας, ἀντὶ τοῦ, ἐμοὶ τὰ παρὰ σοῦ εἰρημένα ῥόδα ἐστίν (*Souda,* 4:297.9–10, no. 203, G. of C., *Corpus,* 86.12–13; Apost., ibid., 635.3–4).

[12] Πολλαῖσι πληγαῖς δρῦς δαμάζεται. Ἐπὶ τῶν δυσαλώτων, (G. of C., PG 142:464 and *Corpus,* 127.22; cf. Apost., *Corpus,* 617.6–7).

[13] Δρυὸς πεσούσης πᾶς ἀνὴρ ξυλεύεται· ἐπὶ τῶν ῥᾳδίως λαμβανόντων ἃ πρότερον μόλις ἠδύναντο and Δρυὸς καὶ πέτρας λόγοι· ἐπὶ τῶν ἀδολεσχούντων καὶ μυθολογούντων παράδοξα (Chrys., *Corpus,* 158.1–4): cf. Δρυὸς πεσούσης πᾶς ἀνὴρ ξυλεύεται· παρόσον ἀνὴρ μέγας ὅταν σφαλῇ, πάντες κατ᾽ αὐτοῦ φέρονται καὶ τὰ αὐτοῦ ἁρπάζουσι (Apost., ibid., 372.2–4).

[14] Συκίνη ἐπικουρία· ἀντὶ τοῦ ἀσθενὴς καὶ ἀνωφελής (Apost., *Corpus,* 648.1–3): cf. Συκίνη μάχαιρα· ἐπὶ τῶν ἀσθενεστάτων καὶ εὐτελῶν. Συκίνη βακτηρία· καὶ συκίνη ἐπικουρία· ἐπὶ τῶν ἀσθενῶς βοηθούντων (Chrys., ibid., 210.3–5); Σύκινος νοῦς· ἐπὶ τῶν ἀνοήτων· παρόσον τὸ σύκινον ξύλον ἀσθενέστατον (Chrys., ibid., 212.5–6).

[15] Τὰ σῦκα σῦκα λέγω, καὶ τὴν κάρδοπον: ἐπὶ τῶν τὰ ἀληθῆ λεγόντων ἀνεπιφθόνως (Apost., *Corpus,* 658.1–2).

[16] Λωτοῦ ἔφαγες· ἐπὶ τῶν σχόντων λήθην τῶν οἴκοι καὶ βραδυνόντων ἐπὶ ξένης (Apost., *Corpus,* 515.2–4).

[17] Κυπαρίττου καρπός· ἐπὶ τῶν καλὰ καὶ ὑψηλὰ λεγόντων, ἄκαρπα δέ (Apost., *Corpus,* 491.5–6).

[18] Μῆλα Ἑσπερίδων μοι ἐδωρήσω· ἐπὶ τῶν πολυτελῆ χαριζόντων (Apost., *Corpus,* 528.14–15).

[19] Μυρρινῶν ἀρχῆς ἐπιθυμεῖς· μυρρίναις γὰρ στεφανοῦνται οἱ ἄρχοντες (Apost., *Corpus,* 538.9–10).

[20] Αἱ λαχάνων προσθῆκαι· ἐπὶ τῶν μηδὲν ὠφελούντων (Apost., *Corpus,* 263.9); Ὁ ἔχων πολὺ πέπερι

with few debts could proudly say that he owed only onions and garlic.[21] These last two vegetables could also express the difficulty in communication and understanding between two people.[22] A need of celery meant that a person was elderly or seriously ill, since tombs were crowned with this in antiquity.[23] These examples could easily be multiplied. Most interestingly we may learn from a demotic proverb that those living close to a gardener could expect to have at least free cabbages.[24]

τίθησι κἀν λαχάνοις· ἐπὶ τῶν εὐπόρως καὶ ἀφθόνως βιούντων (Apost., *Corpus,* 551.8–9): cf. K. Krumbacher, *Mittelgriechische Sprichwörter* (Munich, 1893), 85, no. 32. Similar are two Cypriot proverbs: τὰ φουμισμένα λάχανα γιὰ ἁρμυρὰ γι᾽ ἀνάλατα (A. A. Sakellarios, Τὰ Κυπριακά, vol. 2 [Athens, 1891], 286.285) and σακκὶν λάχανα σκουτέλλιν μαειρκά (ibid., 288.351).

[21] Πᾶν μοι τὸ χρέος κρόμμυα καὶ τὸ τίμημα σκόροδα . . . ἐπὶ τῶν ὀλίγα ὀφειλόντων καὶ εὐτελῆ (Apost., *Corpus,* 601.3–5).

[22] σκόροδα μὲν ἠρωτᾶτο, κρόμμυα δὲ ἀπεκρίνατο (E. Kurtz, *Die Sprichwörtersammlung des Maximus Planudes* [Leipzig, 1886], 44, no. 248).

[23] Οὗτος τοῦ σελίνου δεῖται· ἐπὶ τῶν πάνυ γερόντων καὶ ἐξησθενηκότων· ἐν γὰρ τοῖς πένθεσι σελίνου στεφάνους ἐφόρουν (Chrys., *Corpus,* 198.1–3).

[24] Εἴχαμεν φίλον κηπουρὸν καὶ δίδαμέν του γέννημαν καὶ ἔδιδέν μας λάχανα (Krumbacher, *Sprichwörter,* 77, no. 10 [this proverb is provided with a religious explanation]).

LISA J. KISER

the garden of ST. FRANCIS:

PLANTS, LANDSCAPE, AND ECONOMY IN THIRTEENTH-CENTURY ITALY

POPULARLY ASSOCIATED with the environmental movement, St. Francis (ca. 1182-1226) has long been figured as having an intense devotion to nature and an unwillingness to participate in what his admirers have seen as the tendency of Judeo-Christian culture to promote ideologies resulting in the degradation of the natural world. Especially recognized as showing kindness to animals, St. Francis often is invoked as a figure providing an alternative model of human interaction with other living species, one based not on dominance and mastery of them, but on equality and love. Such conceptions of Francis survive unabated not only in popular devotion to the saint today, but also in the writings of some modern historians of environmental thought, who have found in the medieval texts about St. Francis a genuinely distinctive set of ideas about the potential for non-destructive human interactions with the natural world.[1]

Nonetheless, there are problems inherent in the study of St. Francis, most notably the immense difficulties we face in coming to any clear understanding of his beliefs about the natural world because of the paucity and obscurity of the evidence we have concerning him. Francis himself appears to have written very little, and what he did write is, where extant, of little use in deducing much of any consequence concerning the environment.[2] His followers, however—those who were members of his original brotherhood and those who joined it in the first decades after his death—wrote extensively about their order's founder and his beliefs. In one of these early accounts of Francis's life, he is said to have overseen the construction and maintenance of a garden. Although there are problems in judging the truth of this claim, the details surrounding it nonetheless provide us with a valuable perspective on early Franciscan attitudes toward the landscape at a time when it was undergoing great changes resulting from urbanization and the commercialization of the economy.

The problem with trusting the earliest medieval accounts of Francis's life as unvarnished records of the "truth" is that virtually all of them were written as

contributions to a polemical debate about what ideals the nascent Franciscan order ought to promote, especially the degree of poverty that would be acceptable for members of the order. These texts thus to some extent construct the figure of their founder to conform to whatever position their writers happen to be supporting. Yet it is in these polemical narratives that we find, sometimes vividly expressed, attitudes about the natural world. Those who wished the order to preserve strict notions of apostolic poverty presented stories about St. Francis that underscored the ideal of non-ownership of any personal property, often using analogies from nature to argue their point. Those who, on the other hand, thought that the Franciscan organization, in order to survive and grow, needed justification for private—or at the very least communal—ownership of books, vestments, buildings, and property, painted the picture of a Francis much less stringent in his regulation of poverty and in his prohibitions about interaction with the marketplace. They, too, found justification for their position in the workings of the natural world. Not surprisingly, there are also positions that lie everywhere along the spectrum that exists between these extremes. Thus, the figure of St. Francis became a site upon which thirteenth- and fourteenth-century Franciscan polemicists staged their competing views of what the order should be and what it should become, and all of the polemicists used nature in arguing their case. For this reason, we need to treat the early Franciscan sources with care, no matter what the object of inquiry may be.[3]

A second problem that contributes to the difficulty of recovering information about Francis, his views, and the conceptions of nature embodied in them is that medieval narratives emanating from religious communities are often replete with biblical allusions and conventional allegorical motifs, both of which were considered desirable forms of literary embellishment among the authors and readers of the time. What medieval writers considered as mere embellishment, however, we sometimes would consider as obvious fictionalizing; clearly, medieval standards of "truth" in historical writing often differ immensely from our own. Moreover, the most significant medieval writings about St. Francis are written in the hagiographical genre, a genre in which writers were expected to provide incidents from the saint's life which resemble those found in the life of Christ or which narrate situations with identifiable resemblances to biblical stories and to the lives of early Christian saints. Thus, for example, scenes involving wildlife, landscapes, and other natural phenomena sometimes were borrowed from the Bible or drawn from the plentiful stock of conventional hagiographic motifs, existing less as a record of contemporary medieval life than as part of a complex semiotic system involving the Bible and legends about the primitive Christian saints and martyrs, all of which were considered to be unimpeachable sources for the development of narratives about exemplary human sanctity in the medieval period. Hagiography also required that saints be provided with a number of conventional miracles, because part of hagiography's purpose was to aid in documenting the sanctity of an individual during the process of canonization and, afterward, to encourage the growth and spread of the cult. In addition, the hagiographers who were the most artful in their creation of biographical material

out of whole cloth to meet the genre's requirements were often those respected as the most "authoritative" sources of information about saints, and their works were copied and imitated throughout the Middle Ages. Needless to say, as medieval historians well know, such authorities must be believed at our peril, even though their writings constitute, in some cases, all we have left in the way of contemporary information about the lives of certain medieval individuals.[4]

In spite of its unreliability as a factual source for specific information about individual saints, however, hagiography supplies us with a rich source of information about medieval social and philosophical attitudes. Even when narratives about saints and their exploits are entirely fictional, they nonetheless were written partly in order to promote or discourage certain kinds of behavior and certain patterns of thought in their readership. In other words, one of hagiography's most important purposes was exemplary in nature. It was designed to intersect with actual medieval life by urging its readers to accept certain attitudes about the world around them and then to act accordingly in their daily lives. To this end, hagiographers included in their narratives much that we can identify as "realistic." We can discover in them, for example, clear depictions of medieval gender roles, legal practices, economic behavior, monastic ideology, and local social customs.[5] We also can see, rather vividly in some instances, detailed representations of local geography, with settings tailored to appeal to a readership's identification with a specific place. In those saints' lives that contain geographical description of landscapes (and, along with them, ideas about human interaction with the land), we can detect a variety of medieval environmental attitudes that might otherwise remain hidden from view. In the case of medieval texts about St. Francis, especially those written within the four decades after his death (that is, between 1226 and 1263), we can deduce several things about late medieval environmental thought, specifically about the land, land management, and the botanic environment, at a critical time in Italian environmental history.

EARLY FRANCISCANS AND THE NATURAL WORLD

ALTHOUGH MANY are aware of the animal stories in the Franciscan tradition, few have realized that medieval Franciscan sources also demonstrate strong beliefs about the role of humans as stewards of the land and the flora that it supports. Some early biographies of Francis, for example, express the concepts of environmental sustainability, renewable resources, and the importance of plant life in the community of living things. Francis is said, for instance, to have cautioned his fellow friars about harvesting too much wood from the forests. While collecting firewood, he urged the friars to engage in the practice of coppicing, that is, avoiding destruction of the whole tree, "so that it might have hope of sprouting again."[6] Showing what appears at times to be a rather radically animistic view of the physical world, he also is said to have treated water, rocks, and fire as having sensate being. His biographers note that he would avoid treading on or mistreating the first two, and that he allowed the third–namely, "Brother fire"–to satiate its "hunger" by consuming, at different times, his own

linen underclothes (while he was wearing them) and the roof of the dwelling in which he had temporarily taken shelter. Also, in a companion piece to the famous story about his sermon to the birds, Francis is said to have preached to the wildflowers, treating them as a fully comprehending audience worthy of his closest attention and love.[7]

Perhaps more interesting to the environmental historian, however, are the statements that the saint provided gardening advice, and, in one version of his biography, actually kept a garden himself. These observations might not at first seem remarkable to modern readers, for it is widely known that medieval gardens were ubiquitous, showing up on the grounds of the poorest cottagers, in the backyards of the urban mercantile classes, on the estates of the noble and the wealthy—and on the enclosed property belonging to monastic institutions.[8] What makes Francis's garden such a surprise to the medievalist is the knowledge that the saint was deeply committed to an itinerant life, a life of mendicancy characterized by wandering and begging door-to-door in towns and in the countryside for his food—a life, in short, removed from the geographical stability that tending a garden would seem to entail. His beliefs about strict poverty, visible in his early Rules, precluded personal ownership of anything (especially land). His earliest biographers remained true to the spirit of the early Rules by identifying his process of food procurement with that of animals and birds—one either foraged for food in the great outdoors or ate whatever was given to one as alms. Indeed, one of Francis's strictest prohibitions is said to have been against the storing of food to be used in the future, the very thing a garden is designed to provide. Using an animal analogy (of the sort that is so frequent in the writings of the early Franciscans), one of his admirers wrote that Francis disparaged the ant "because of the great diligence she hath in gathering together and storing up. ... He was wont to say that the birds pleased him much more, because they laid up not one day for the next."[9] In another passage from the writings of his followers, Francis's love of the lark is noted, with the bird gaining Francis's affection by the lowliness of its food and the spontaneity of its food collection. "Sister lark," he is reported to have said, "is a humble bird who goes cheerfully along the road to find herself some corn, and even if she finds it among the dung of beasts, she takes it out and eats it."[10]

Moreover, one of the earliest polemical texts about St. Francis, the *Sacred Exchange Between St. Francis and Lady Poverty* of 1237 to 1239, overtly rejects the notion that the saint and his companions had access to a garden, clearly taking a strong position against Franciscan involvement with privatization of the land: "Since they did not have a gardener and knew nothing of a garden ... they gathered wild herbs in the woods."[11] Why, then, would a traveling mendicant, with an aversion to the ideas of property ownership and the storage of food for future use, condone a stationary, privately possessed tract of land intended to provide deferred food supplies? And why would one of his most conservative followers, a man committed to preserving rigorous standards of poverty, allow the saint to be represented as having an interest in such a place? Yet one of the earliest Franciscan biographical texts that we have, Thomas of Celano's *The Remembrance*

of the Desire of a Soul (1247), written about twenty years after the saint's death, contains an anecdote about the saint's garden plot, complete with its own gardener. The remainder of this essay will focus on Thomas's treatment of Francis's garden, which will be analyzed both as a feature following the conventions of the hagiographical genre and, more importantly, as a vehicle for understanding actual medieval thinking about human relationships to the land.

THE HAGIOGRAPHIC BACKGROUND

ALTHOUGH SOURCES earlier than Thomas of Celano's *Remembrance*, including his own *Life of St. Francis* (1228-1229) as well as the *Scripta Leonis* (a source for Thomas's *Remembrance*), do not suggest that the saint himself had a garden, it is likely that Thomas—a well-educated Latinist trained in the literary conventions of hagiography—decided to provide Francis with his own garden partly because ownership of gardens was a common literary motif in the biographies of the early desert fathers, those figures whose biographies served as models for medieval hagiography in general.[12] These primitive Christian saints, who were represented as having withdrawn from the world to live eremitic lives in the wilderness, usually had small gardens attached to their caves or huts out of which they scratched their meager subsistences. St. Antony, for instance, considered to be the saint-founder of monasticism, is said to have withdrawn in the fourth century to the Nile Valley and then to the mountains of Egypt, where he grew wheat for his bread and, later in his life, vegetables for visitors.[13] Other saints, such as Paul the Hermit, Jerome, Felix, Romanus, Aemilianus, Phocas, Godric, Hilary, and Fiacre also are reported to have been gardeners, cultivating their spiritual selves along with their patches of ground.[14] In hagiographical literature, the topos of the garden served to mark these saints as having withdrawn significantly from the worldly marketplace and having achieved a kind of economic self-sufficiency away from the secular affairs of the world.[15] Thus Thomas, Francis's hagiographer, is able to underscore the saint's primitive austerity by providing him with a garden, for the garden allegorically signified flight from the world.

In addition to the suggestion that monks with gardens had escaped from secular society to live self-sufficiently off the fruits of their own labors, gardens in religious texts also had theological significance that we cannot ignore. As symbols of Eden, medieval gardens would have reminded their visitors of the natural beauty of humanity's original protected dwelling place, urging them to contemplate the unhappy result of the Fall and the desirability of making peace with God in order to live once again in his Heavenly garden. That is, gardens on earth, especially those connected to religious institutions, were created, among other more practical reasons, to remind Christians of the biblical dialectics of the Fall and Salvation, and they did so by alluding to both Eden and Heaven, the terrestrial Paradise and the heavenly one to which good Christians aspire. As this theological tradition developed in the Latin West, gardens took on more elaborate religious symbolism, often referring to the Virgin Mary herself, whose virginal fertility was sometimes compared to an enclosed garden (the *hortus*

conclusus of the Song of Songs), a private and inviolate space that somewhat paradoxically produced fruit–in Mary's case, the fruit of Christ himself. Gardens thus allowed medieval Christians a chance to meditate on the theology of their salvation, and to do so through the concrete vehicle of geographical form. Although Thomas does not overtly theologize Francis's garden in this way, his monastic readership certainly would have recognized their own monastic gardens as having these symbolic functions.[16]

There is a further reason for the insistence on Francis's garden that is worth considering, namely, that its presence might have helped Thomas to legitimize Francis's new order of friars. At a time when the leaders of many radical Italian religious movements were being persecuted for heresy, Thomas would have wanted Francis's sect to have resembled, at least in some of its practices, the familiar and well-regarded monastic orders that followed the Benedictine Rule, which mentions the monastic garden in its forty-sixth chapter. Cloistered monks throughout the medieval period routinely kept gardens, both for growing their own food and spices and for cultivating medicinal herbs to aid in the healing of their ill brethren. Monastic customaries, documents written to elaborate upon how each house's practices conformed to the Benedictine Rule, sometimes mention in detail the kinds of things that should be grown in a monastic garden; the typical vegetables, generally associated with humility, included cabbage, leeks, beans, garlic, onions, turnips, and radishes, with whatever else might be necessary in the infirmary.[17] By having Francis and his fellow friars attached to a garden, then, Thomas might have been providing his saint with a recognizably monastic identity, one in line with what was expected of an upstanding member of a cloistered spiritual community, yet one whose customs and values subtly reminded readers of the primitive–and rigorously observed–ideals of the ancient fathers of the desert.

THE GARDEN OF ST. FRANCIS

AT THE SAME time that Thomas might have been attempting to legitimize Francis and his order by supplying them with a monastic garden, details provided about the garden suggest that Thomas wished to call attention to its uniqueness. It is now time to look in detail at the garden that Thomas has provided for Francis:

> Iubet hortulanum indefossos limites circa hortum dimittere, ut suis temporibus herbarum viror et florum venustas praedicent speciosum rerum omnium Patrem. Hortulum in horto herbis odoriferis et florificis praecipit designari, ut in memoriam suavitatis aeternae avocent speculantes.
>
> [He commands the gardener to leave the edges of the garden undug, so that in their season the greenness of the grass and the beauty of flowers may proclaim the beauty of the Father of all. It is designated that within the garden there be a smaller garden for aromatic and flowering plants so that those who see them may be diverted by the memory of eternal sweetness.][18]

Clearly, as Thomas describes it, Francis's garden is supposed to be seen as different from those of other saints and from those of the monastic tradition

with which Thomas's thirteenth-century readers would have been familiar. When Thomas notes that Francis wishes the borders of the garden to remain unditched, or undug (*indefossos limites*), and that he further wishes to have a portion of the garden plot devoted solely to aromatic and flowering plants, Thomas is suggesting that Francis is distinguishing his garden from those ordinarily expected among medieval monastic tillers of the earth. In other words, at the same time that he is trying to demonstrate Francis's credentials as a gardening-saint and as a bona-fide monastic community member, he also is striving to make Francis's garden idiosyncratically "Franciscan."

To understand the import of Francis's apparent deviations from the plans of typical medieval monastic gardens, it is important to identify the normative structures that his garden violates. A major deviation can be seen in the unditched borders of Francis's garden, which would have been anomalies indeed. Medieval European gardens of all kinds typically were heavily marked out from their surrounding spaces by ditches, walls or some other sort of enclosure. In a twelfth-century encyclopedia, under the category "garden" (*ortus*), the anonymous author writes that a garden is a space "surrounded by ditches and hedges" (*circumfoditur et circumsepitur*), as if that were the single defining feature that separated gardens from other pieces of land.[19] Both of the distinguishing words used in the passage about Francis's garden, *limites* and *indefossos*, are technical terms, the first meaning the legal boundary separating private property from land adjacent to it, and the second referring to the ditch that gardeners often would use to demarcate the edges of their gardens.[20] John Harvey sums up the steps taken to create a medieval garden in the following way: "When a garden was to be formed, the first essential was enclosure. This normally involved the formation of an external ditch with a fence or hedge on the bank made by casting up the soil inwards. Inside the bounding ditch might be a paling fence, or a live hedge, or a stone wall. Walls were often built around gardens; though more costly in outlay, they were generally economical in maintenance."[21]

Ditches, fences, and walls around medieval gardens served a variety of purposes. First, enclosure served to demarcate the garden as "private property"—as a space that was being managed and overseen by someone for his or her own personal benefit. They were a powerful marker of privatized space, and medieval legal codes were explicit and detailed in outlining the fines or other punishments that would accrue to anyone who breached the boundaries of someone else's garden.[22] Enclosures around gardens acted either as signals to deter human trespassing (in the case of a ditch alone) or as actual barriers to prevent theft of the garden's contents (in the case of a wall or a fence). Second, ditches, fences, and other enclosures kept out animal intruders, such as cattle, foxes, and small rodents. The ditch also prevented the root systems of unwanted plants that spread by underground runners (such as some grasses) from invading and colonizing the garden. Third, strict enclosure of the explicitly monastic garden would have further contributed to the symbolic separation of monastic life in general from that of the uncloistered population at large.

In giving Francis an unditched garden, Thomas is first of all clearly suggesting the saint's uneasiness with the concept of overly-managed land, that is, land prevented from behaving as it might if humans were not in control of it. The saint wanted the garden to be open enough to permit the invasion of surrounding plant life, allowing inside the garden's perimeters whatever plants came to rest there by their own devices. Likely volunteers in Francis's garden would have been grasses from the surrounding turf (*viror herbarum*), whose roots could have penetrated the unditched plot, or—as Thomas seems to imagine—wildflowers, which would bloom "in their seasons" (*suis temporibus*) to ornament the garden with unanticipated beauty.[23] Francis's garden, in other words, has a spontaneous and unplanned dimension, with nature's processes being allowed to shape it as they might. There exists no concept such as "weed" for the gardeners of this Franciscan plot, nor are its plants distinguished markedly from the wild plant communities surrounding it. In this way, Thomas celebrates a very Franciscan idea, one to be applied to human life (though here embodied in plants), namely, that the privileging of one kind of creature over another, whether by social class (as in the case of humans) or by plant status (as in the case of vegetables versus "weeds"), is wrong—as well as destructive of the Christian principle of God's love for all of his creation. For Francis, the greenness of the invading grass and the beauty of the self-seeding wildflowers forcefully contribute to his belief in the equality and praiseworthiness of all of earth's inhabitants (animal, vegetable, or mineral), including those of humble status, each of which was placed on earth to garner the Christian's respect and love.[24]

In addition, the unditched borders diminish the sense that the garden is a private possession being managed by a proprietary overseer. It is instructive to note here that one of the most common garden motifs in hagiographical literature relates to saints and holy men who, by supernatural means, prevent intruders from entering their enclosed gardens and stealing their vegetables. For example, St. Felix's garden is violated by thieves, but through his miraculous powers, the thieves end up tilling it for him all night as a form of divine punishment. St. Godric scolds wild deer for stealing from his elaborately enclosed orchard-garden, and they obey him. A monastic gardener in Gregory's *Dialogues* orders a snake to guard his hedged vegetable patch, and it succeeds in scaring away thieves. St. Antony, bothered by the wild animals in the desert which trample his garden in search of water, commands them to stop, and they do.[25] Thus, in spite of monastic exhortations against the spirit of private ownership, there remained a widespread prejudice that monks deserved to have for themselves whatever their gardens produced. Hagiographical literature continually underscores the notion that saints are strong "border-markers" serving to help delineate the separate spaces of the sacred and the profane, and that intruders into their private lands are violators of these sacred boundaries.[26] Although Francis's garden is in part meant to recall the gardens of these previous holy men, his unditched borders are definitely a Franciscan innovation, one which quietly undermines the proprietary displays of the holy men who came before him. Moreover, in opening up Francis's

garden to the world outside, Thomas is taking a visible stand against the increasingly widespread practice, especially in the Italy of his own time, of privatizing land that once before had been open to common rights of use.[27] We surely would not be amiss in attributing his resistance here to his belief that Franciscanism was—or should be—opposed to exclusionary practices of any kind.

The second major point implicit in Thomas's descriptive passage is that St. Francis had a peculiar aversion to the concept of the strictly utilitarian garden. By writing that the saint wanted a small plot set aside within the confines of the vegetable garden, a *hortulum in horto*, to be designated for sweet-smelling and flowering plants (*herbis odoriferis et florificis*), Thomas suggests that this was an unusual demand and an unusual configuration for a garden plot. Francis was, in fact, acting contrary to the most common practices of small monastic institutions here by mixing non-utilitarian flowers with vegetables and medicinal herbs. Large monastic institutions often would have cloister garths (mowed or scythed grassy spaces with flowerbeds along the walls) for the monks' enjoyment and peaceful contemplation or for cultivating flowers with symbolic Christian meaning (such as roses and lilies) to ornament the church on special feast days. Flower gardens *per se*, however, were not common and were, in fact, markers of wealth, leisure, and elevated social station when grown in any lavish or conspicuous display, a gesture at odds with monastic philosophy.[28] The gardens of monastic institutions generally were intended to be symbolic of the monks' humility and poverty, with vegetables grown there that would make monastic diets resemble those of the peasant classes.[29] The Fleury customary notes, in its inventory of what might be grown in the monastic garden, that it is for "useful plants" (*proficuas herbas*)—those serving as actual food (*pulmenta*) or as compounds to sweeten bitter food and flavor healthful teas.[30] At Corbie, records from which are particularly detailed, we find that the gardens in this ninth-century monastery were to contain "plants of whatever kind, out of which food can be made" (*herbae cujuslibet generis, unde pulmentarium fieri debet*).[31] And Cassiodorus's *De institutione divinarum litterarum*, a book consulted as a model for monastic culture throughout the entire medieval period, suggests that monasteries had gardens for growing plants useful in two capacities only: for nutriments and for medicines.[32] Therefore, Francis's plan to have a flower garden—solely for olfactory and visual pleasure—was unusual, and even, perhaps, mildly transgressive of thirteenth-century monastic custom.

The image of the non-utilitarian garden gives expression to some central Franciscan doctrines involving nature and the various life forms included under its general purview. First of all, the non-productive garden space would have supported the early Franciscan belief that storing up surplus food for the future was a morally negative act, contrary to a friar's true faith that God (not a garden) would provide for one's needs. As Francis is said to have preached to the birds, "Though you neither sow nor reap, [God] nevertheless protects you and governs you without your least care."[33] Moreover, Francis was characterized, by all his hagiographers and by others who claimed to have known him, as having been

deeply susceptible to natural beauty, having been aesthetically (and presumably spiritually) inspired by the humblest of living things. Those familiar with the "Canticle of Brother Sun," a poem attributed by many to Francis himself and one of the most moving declarations extant of the pleasure that nature brings to humanity, will remember its praise for the beauty of "our Sister Mother Earth" (*sora nostra matre Terra*), especially for her "colored flowers and plants" (*coloriti flori ed erba*), a phrase that Thomas surely borrowed to describe those very flowers and sweet-smelling plants that he had Francis order for his *horticulum in horto*.[34]

IMPLICATIONS FOR ENVIRONMENTAL HISTORY

BY STUDYING Francis's garden within its larger setting, then, we can gain an understanding of some thirteenth-century Italian attitudes about the land and its botanical life, attitudes that do not often get overtly expressed in other kinds of writing, whether scientific or religious. Francis's garden, too, helps us understand early Franciscan ideology better, because its details show how Francis's ideas might have been extrapolated and instantiated in actual horticultural practice. Finally, after studying his garden, we might also be better able to explain one of the most mysterious passages in all of medieval Franciscan literature, one likewise predicated on a representation of the saint's thinking about the land. In a passage at the very beginning of Thomas of Celano's *Life of St.Francis*, written in 1228 to 1229, we learn that the young Francis began his conversion with a glimpse of the countryside:

> Die quadam foras exivit et circumadiacentem provinciam coepit curiosius intueri. Sed pulchritudo agrorum, vinearum amoenitas et quidquid visu pulchrum est, in nullo eum potuit delectare. Mirabatur propterea subitam sui mutationem, et praedictorum amatores stultissimos reputabat.
>
> [H]e went outside one day and began to gaze upon the surrounding countryside with greater interest. But the beauty of the fields, the delight of the vineyards, and whatever else was beautiful to see could offer him no delight at all. He wondered at the sudden change in himself, and considered those who loved these things quite foolish.[35]

Given Francis's later commitment to the beauties of the natural world, this passage seems strange indeed. Why would he be portrayed as rejecting, early on, the very natural beauty that his followers, Thomas especially, would later proclaim as central to his understanding of himself as the harbinger of a new order, of a new way of relating humanity to its natural environment? Using the example provided by the details in Francis's garden, a persuasive case can be made that this passage confirms, rather than contradicts, what Thomas was suggesting about the saint's relationship to the land. For what Francis is surely imagined as seeing here in the landscape of the fields and the vineyards of Assisi's surrounding *contado*, is the image, writ large, of the overly-managed landscape that he later rejected in his garden. The landscape that Thomas shows him gazing upon, especially its fields and vineyards, betrays the unmistakable marks of human cultivation, of nature tamed and disciplined in its service to the emerging

capitalist agricultural economy, the very economy the saint had hoped to critique—and then escape. What we are to imagine Francis detecting behind this simple outdoor scene is the presence of a hidden but powerful system of private land ownership by the Umbrian nobility, the rising bourgeoisie, and the wealthy church, a system of exploitation and exchange which he later came to oppose.[36] The observation that Europe in general underwent what we might call the "gardenization" of the countryside in the centuries after the agricultural revolution, which is especially well documented for western and central Europe by French medievalists of the *Annales* school, has been confirmed and refined by Italian historians, who have thoroughly analyzed the privatization, fragmentation, and enclosure of the Italian landscape which resulted from both urbanization and the rise of the precapitalist market economy. Northern and central Italian city dwellers of the late twelfth century—including Francis's own father at the time the saint experienced his conversion—would have witnessed directly the effects on the landscape of the increased productivity sought from the cities' surrounding areas. [37]

We need, therefore, to analyze Francis's garden as an important Franciscan response to the economic and social changes of the twelfth and thirteenth centuries. Both his open garden—which allows access to those with no private claim to its contents—as well as his advice to plant a garden with non-utilitarian dimensions—which quietly argues against production of the sort of surplus that might be sent to market for profit—demonstrate Thomas of Celano's rebellion against the proprietary and market-oriented use of the land which was predominant around cities at the time he was writing and which, to him, represented a force that Franciscanism needed to oppose. It is also significant both to the history of the Franciscan order and to the history of environmental thought that in the decades following Thomas's portrayal of St. Francis, the saint's garden virtually disappeared in the literature about him, as did the saint's reflections on the landscape, his preaching to the flowers, and his commitment to the principles of wise forestry. This later lack of attention to the land and the plant life it supports is especially true of the "official" biography of the saint, the *Legenda Major* written by Bonaventure in 1263. We cannot explain this change of attitude with any certainty, but it surely reflected changes in the ideology of the Franciscan order itself, which was becoming more accustomed to the values of the marketplace and more dependent on the support of the urban mercantile class for its later survival and growth. In the years following Francis's death, the order became less invested in establishing connections with the countryside and its wildlife, and instead identified itself more closely with the economically complex urban centers that provided both the people and the resources for the order's continuing success. Thomas of Celano, perhaps recognizing that the order was beginning to move in this direction, clearly characterized Francis in such a way as to remind his readership of the primitive ideals of the order's founder, one of them being the rejection of the concept of privatized, heavily-managed land being employed as part of a system of mercantile exchange.[38]

Thus St. Francis's garden provides us with an unusual perspective on a moment in historical time–the change from older, feudal economic arrangements to incipient capitalism–that was of great significance to the development of modern European attitudes toward the land. Recognizing that the motif of the saint's small plot of ground could have enormous economic and social implications when its function and its design were used to critique the larger socio-economic trends visible in the Italian countryside, Thomas used it, and Francis himself, to protest others' unexamined assumptions about humanity's place in a world filled with other living beings, each of which has a claim to–and a rightful place in–environments unfortunately dominated by the model of human economic gain.

Lisa J. Kiser *is a professor of English at The Ohio State University. She is the author of* Telling Classical Tales: Chaucer and the Legend of Good Women *(1983),* Truth and Textuality in Chaucer's Poetry *(1991), and a number of essays and reviews on nature in the Middle Ages.*

NOTES

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1. This argument was first promulgated in 1967 by Lynn White, Jr., "The Historical Roots of Our Ecologic Crisis," *Science* 155 (March 1967): 1203-07, but it has reappeared in more recent historical analysis. See, for example, Edward A. Armstrong, *Saint Francis, Nature Mystic: The Derivation and Significance of the Nature Stories in the Franciscan Legend* (Berkeley: University of California Press, 1973); David J. Herlihy, "Attitudes Toward the Environment in Medieval Society," in *Historical Ecology: Essays on Environmental and Social Change*, ed. Lester J. Bilsky (Port Washington, N.Y.: Kennikat Press, 1980), 115; Franco Cardini, "Francesco d'Assisi e gli animali," *Studi Francescani* 78 (1981): 7-46; Roger D. Sorrell, *St. Francis of Assisi and Nature: Tradition and Innovation in Western Christian Attitudes Toward the Environment* (Oxford: Oxford University Press, 1988); P. Hooper and Martin Palmer, "St. Francis and Ecology," in *Christianity and Ecology*, ed. Elizabeth Breuilly and Martin Palmer (London, Cassell, 1992), 76-85; Susan Power Bratton, *Christianity, Wilderness and Wildlife: The Original Desert Solitaire* (Scranton, Pa.: University of Scranton Press, 1993); and J. D. Hughes, "Francis of Assisi and the Diversity of Creation," *Environmental Ethics* 18 (1996): 311-20. Clarence J. Glacken, in *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century* (Berkeley: University of California Press, 1967), 214-16, notes some of the narratives in the Franciscan canon that have stimulated scholarly thinking about Francis's attitudes toward nature.
2. The surviving writings attributable to St. Francis himself include a number of short prayers, letters, admonitions, and exhortations; two Rules for his order (one of 1221 and one of 1223); a Testament of 1226; and some devotional verse praising God and his creation. See *Francis of Assisi: Early Documents*, ed. and trans. Regis J. Armstrong, J. A. Wayne Hellmann, and William J. Short (New York: New City Press, 1999), vol. 1, *The Saint*, 35-167. This series of volumes containing medieval Franciscan texts hereafter will be cited in the abbreviated form, *Early Documents*.

3. For the early history of the Franciscan order and the economic controversies within it, see John H. R. Moorman, *A History of the Franciscan Order from Its Origins to the Year 1517* (Oxford: Clarendon Press, 1968), esp. 105-54; Rosalind B. Brooke, *Early Franciscan Government* (Cambridge: Cambridge University Press, 1959); David Burr, *The Spiritual Franciscans: From Protest to Persecution in the Century After Francis* (University Park: Pennsylvania State University Press, 2001); M. D. Lambert, *Franciscan Poverty: The Doctrine of the Absolute Poverty of Christ and the Apostles in the Franciscan Order, 1210-1323* (London: S.P.C.K., 1961), 67-102 and 126-40; and Lester K. Little, *Religious Poverty and the Profit Economy in Medieval Europe* (Ithaca, N.Y.: Cornell University Press, 1978), 146-69. On the medieval legends' role in these controversies, see Moorman's *The Sources for the Life of St. Francis of Assisi* (Manchester: Manchester University Press, 1940), esp. 141-48, and Burr, *Spiritual Franciscans*, 16-29.
4. On the conventions of hagiographical narratives and their unreliability as documents of historical fact, see Thomas J. Heffernan, *Sacred Biography: Saints and Their Biographers in the Middle Ages* (Oxford: Oxford University Press, 1988), esp. 38-71; Donald Weinstein and Rudolph M. Bell, *Saints and Society: The Two Worlds of Western Christendom, 1000-1700* (Chicago: University of Chicago Press, 1982), 1-15; and Richard Kieckhefer, *Unquiet Souls: Fourteenth-Century Saints and Their Religious Milieu* (Chicago: University of Chicago Press, 1984), 1-20.
5. For example, social information regarding attitudes about gender, class, and local place derivable from hagiographical narratives is examined by Weinstein and Bell, *Saints and Society*, 166-238.
6. Quoted from Thomas of Celano, *Remembrance of the Desire of a Soul*, sec. 124, in *Early Documents*, vol. 2, *The Founder*, 354. (In earlier scholarship, Thomas's *Remembrance* is often referred to as the *Vita Secunda*.) See also *Mirror of Perfection*, chap. 118 (*Early Documents*, vol.3, *The Prophet*, 366) and *Scripta Leonis, Rufini et Angeli Sociorum Francisci*, ed. and trans. Rosalind B. Brooke (Oxford: Clarendon Press, 1970), chap. 51, 179. Cp. Job 14:7. The medieval practice of coppicing trees to harvest wood from a continuously growing trunk and root stock is described in Roland Bechmann, *Trees and Man: The Forest in the Middle Ages*, trans. Katharyn Dunham (New York: Paragon House, 1990), 201-12.
7. For the best-known passages about rocks and water, see *Remembrance*, chap. 24 (*Early Documents*, 2:354); *Scripta Leonis*, sec. 51, 179; and *Mirror of Perfection*, chap. 118 (*Early Documents*, 3:366). For passages about fire, see *Mirror of Perfection*, chap. 116 (*Early Documents*, 3:365); and *Scripta Leonis*, secs. 49-50, 177. For the wildflowers, see Thomas of Celano's *Life of St. Francis*, chap. 29 (*Early Documents*, 1:251).
8. The literature on medieval gardens is extensive and specialized. Useful general studies include John Harvey, *Mediaeval Gardens* (Beaverton, Ore: Timber Press, 1981); Sylvia Landsberg, *The Medieval Garden* (New York: Thames and Hudson, 1995); Elisabeth B. MacDougall, ed., *Medieval Gardens*, Dumbarton Oaks Colloquium on the History of Landscape Architecture, vol. 9 (Washington, D.C.: Dumbarton Oaks, 1986); and Filippo Pizzoni, *The Garden: A History in Landscape and Art*, trans. Judith Landry (New York: Rizzoli, 1999), 10-11 and 20-26. On secular medieval Italian pleasure gardens, see Johanna Bauman, "Tradition and Transformation: The Pleasure Garden in Piero de'Crescenzi's *Liber ruralium commodorum*," *Studies in the History of Gardens and Designed Landscapes* 22 (2002): 99-141; Robert G. Calkins, "Piero de Crescenzi and the Medieval Garden," in *Medieval Gardens*, MacDougall, 155-73; Franco Cardini, "Il limite: Il giardino e la poetica delle spazio chiuso," in *Il giardino e la mura: Ai confini fra natura e storia*, ed. Cristina Acidini Luchinat, Giorgio Galletti, and Maria Adriana Giusti, Atti del Convegno di Studi San Miniato Alto, Pisa, 1995 (Florence: Edizioni

Firenze, 1995): 23-36; and Georgina Masson, *Italian Gardens* (New York: Abrams, 1961). On vegetable and medicinal gardens in medieval Italy, especially between the eighth and tenth centuries, see Massimo Montanari, *L'alimentazione contadina nell'alto Medioevo* (Naples: Liguori Editori, 1979), 22-27 and 309-71.

9. *The Sayings of Brother Giles*, chap. 7, trans. Thomas Okey, in *The Little Flowers of St. Francis; The Mirror of Perfection; St. Bonaventure's Life of St. Francis*, intro. Hugh McKay (New York: Dutton, 1973), 166.
10. *Scripta Leonis*, chap. 110, 283. See also *Mirror of Perfection*, chap. 113 (*Early Documents*, 3:362).
11. *Early Documents*, 1:552. It is also relevant here to note that Jacques de Vitry, in his *Histories of the East and of the West* (ca. 1223), underscores the notion of the rootlessness of the early Franciscans by saying that "the world is their spacious cloister" (cited in Little, *Religious Poverty*, 167). See also Little's characterization of the early Franciscans: "The Franciscans tended to stay in caves and huts, or just wherever they could find temporary shelter. ... Francis urged his brothers to live in the world as pilgrims and strangers, in part so that they would not become attached to any one place. The friars avoided utterly the Benedictine notion of stability of place, having absorbed into their notion of the apostolate something of the extensive travel engaged in by the original Apostles," 159.
12. Thomas of Celano's original life of St. Francis, the so-called *Vita Prima* (1228-1229), does not contain the garden. His *Remembrance of the Desire of a Soul* (1247), rather than being a full-fledged biography, is actually a biographical addendum, providing further anecdotes about Francis, some of them collected from sources unavailable to the author when he wrote his *Vita Prima*. One of these sources was the *Scripta Leonis*. There, Francis makes remarks about a garden plot attached to a friary in which he was staying, a much more rational narrative than the one suggesting that he owned the garden himself. Yet if Thomas did use this story as his source, he dropped the friary, added many details, and attributed the garden to Francis. The garden also appears in one text much later than Thomas's, namely *The Mirror of Perfection*, chap. 118, a work which borrows heavily from his. The official biography of Francis, written by St. Bonaventure in 1260-1263, does not include the garden.
13. For a convenient translation of the garden passage, see *St. Athanasius's Life of St. Antony*, trans. Robert T. Meyer, Ancient Christian Writers Series, vol. 10 (Westminster, Md.: Newman Press, 1950), 63.
14. Romanus and Aemilianus are portrayed in Gregory of Tours's well-known *Vita Patrum*. See *Vita Patrum: The Life of the Fathers*, trans. Fr. Seraphim Rose (Platina, Calif.: St. Herman of Alaska Brotherhood, 1988), 123 and 240. Felix appears in Jacobus de Voragine's *Golden Legend*, trans. Granger Ryan and Helmut Ripperger (New York: Arno Press, 1969), 93. For Godric, see Helen Waddell, *Beasts and Saints* (Grand Rapids, Mich.: William B. Eerdmans, 1934), 73-75.
15. See Paul Meyvaert, "The Medieval Monastic Garden," in MacDougall, *Medieval Gardens*, 25-26. For a glimpse of some of the desert fathers' gardens, see Helen Waddell, *The Desert Fathers* (New York: Henry Holt, 1936), 84, 149, 185, 210, 223-24, and 244-45. John Cassian's *De coenobiorum institutis*, a foundational work for Western monasticism, also notes the presence of gardens among the anchoritic and cenobitic monks in the Egyptian desert; see esp. Book 4, chaps. 18 and 30, and Book 10, chap. 24, in *Patrologiae cursus completus: Series Latina*, ed. J. P. Migne (Paris: J.P. Migne, 1844-1865) vol. 49, cols. 177, 192 and 395 (hereafter *PL*). Cassiodorus's *De institutione divinarum litterarum*, a treatise concerning the ways in which desert monasticism intersects with medieval monastic life, notes that monks should cultivate gardens for their food and medicines; see *PL* 70, cols. 1142-43. On the garden motif in hagiography in general, see Montanari, *L'alimentazione*, 339-42.

16. For scholarly treatments of the theology implied by the medieval garden, see, for example, Derek Pearsall and Elizabeth Salter, *Landscapes and Seasons of the Medieval World* (Toronto: University of Toronto Press, 1973), 56-118; A. Bartlett Giamatti, *The Earthly Paradise and the Renaissance Epic* (Princeton: Princeton University Press, 1966), 48-86; Brian E. Daly, "The 'Closed Garden' and the 'Sealed Fountain': Song of Songs 4:12 in the Medieval Iconography of Mary," in Macdougall, ed., *Medieval Gardens*, 267-78; and Marcello Fagioli, "Le mura e il giardino," in Luchinat, Galletti, and Giusti, *Il giardino*, 2-3. For actual medieval archeological evidence from late medieval Norwich suggesting that some monastic gardens may have had exclusively spiritual functions, see Claire Noble, "Spiritual Practice and the Designed Landscape: Monastic Precinct Gardens," *Studies in the History of Gardens and Designed Landscapes* 20 (2000): 197-205.
17. See, for example, the customary by Thierry of Amorbach (supposedly reflecting the usages of Fleury around the year 1000) in *Consuetudinum Saeculi X/XI/XII Monumenta Non-Cluniacensia*, vol. 7, pt. 3, ed. Kassius Hallinger OSB, Corpus Consuetudinum Monasticorum (Siegburg: Franz Schmitt, 1984), 32. My thanks to Christopher A. Jones for locating this reference. On medieval Italian monastic gardens, and the kinds of plants and vegetables grown in them, see Montanari, *L'alimentazione*, 338-71.
18. *Remembrance*, chap. 124. All Latin quotations are from the edition of the Quaracchi Fathers in *Analecta Franciscana* 10 (1926): 226. My translation is partially based on that of Placid Hermann, who refers to the work by means of its older title, *Vita Secunda*, in *St. Francis of Assisi, Writings and Biographies: English Omnibus of the Sources for the Life of St. Francis*, ed. Marion Habig (Chicago: Franciscan Herald Press, 1983), 495. I also have consulted the translation in *Early Documents*, 2:354.
19. *De bestiis et aliis rebus libri quatuor*, chap. 13, *PL* 177, col. 154.
20. See Luciano Lagazzi, *Segni sulla terra: Determinazione dei confini e percezione dello spazio nell'alto Medioevo*, Biblioteca di Storia Agraria Medievale, vol. 8 (Bologna: Cooperativa Libraria Universitaria Editrice, 1991), 22 and 26; on *limites*, Lagazzi, *Segni*, 54-56, also cites Isidore of Seville's *Etymologies*, in which the tenth-century author notes that the term is applied to refer to agrarian boundaries (chap. 15, section 14). On *fossatum* as a gardening term, see also Piero de' Crescenzi's *Liber ruralium commodorum*, which describes how gardeners should dig out borders along the edges of their gardens. See Book 8, chap. 2, sec 1 and chap. 5, sec. 1, ed. and trans. Johanna Bauman, "Tradition and Transformation": 101 and 105.
21. *Mediaeval Gardens*, 110. See also Theresa McLean, *Medieval English Gardens* (London: Collins, 1981), 37; Landsberg, *The Medieval Garden*, 63; and Bridget Ann Henisch, *The Medieval Calendar Year* (University Park: Pennsylvania State University Press, 1999), 62, where the author writes: " If a dictionary of medieval gardening terms were ever to be compiled, the two most important entries under the letter C would be control and containment."
22. Law codes from the ninth and tenth centuries have been especially carefully analyzed for garden-breaching crimes by Montanari, *L'alimentazione*; see esp. 23, where he quotes one legal document thus: "Si quis in orto alterius introierit aut salierit ad furtum faciendum, conponat solidos sex (If anyone enters or leaves another's garden for the purpose of committing theft, he will pay six solidos)." Lagazzi, *Segni*, 23 and 26-29, treats some of the same statutes as Montanari, underscoring the notion of gardens as highly privatized spaces. In the Salic Law of the Franks (510-750), admittedly remote in space and time from the material we have been treating, the punishment for breaking into an enclosed garden was five times more severe than for unenclosed ground, an interesting fact that reflects on an earlier, and very proprietary, medieval attitude

toward enclosed gardens. See Harvey, *Mediaeval Gardens*, 27.

23. Here it is useful to compare Thomas's text with that of his source, the *Scripta Leonis*, in which Francis advises a friary gardener to "set free part of the land so that it will produce green plants which in their time will bring forth Brother Flowers" (chap. 51, in Brooke, 178; my translation). This text, more obviously than Thomas's, suggests that Francis is imagining wildflowers (rather than cultivars) growing in the garden.
24. On the medieval belief in the inherent "social status" of various plants (which Francis calls into question here), Allen J. Grieco, "The Social Politics of Pre-Linnaean Botanical Classification," *I Tatti Studies: Essays in the Renaissance* 4 (1991): 131-49; and Grieco's essay "The Social Order of Nature and the Natural Order of Society in late 13th–early 14th-Century Italy," *Miscellanea Mediaevalia* 21/2 (1992): 898-907. For a rare medieval anecdote about the burdensome practice of weeding large monastic gardens, see Montanari, *L'alimentazione*, 350-51. It is also interesting to note that the open, potentially weed-filled, garden parallels Francis's own beliefs about his order: despite papal concern, he wanted anyone, regardless of training, social status, or experience, to be allowed to enter his brotherhood.
25. For Felix, see Jacobus de Voragine, *Golden Legend*, 93; for Godric, see Waddell, *Beasts and Saints*, 73-75; for the monastic gardener and his snake, see Gregory's *Dialogues*, Book 1, chap. 3, in *The Dialogues of Saint Gregory*, trans. Philip Warner (London: Medici Society, 1911), 14-15; for Antony, see Athanasius's *The Life of Saint Antony*, 63.
26. See Lagazzi, *Segni*, 70-79, for saints as boundary-keepers.
27. For examples from an earlier period, see Lagazzi, *Segni*, 53 and 66; and Montanari, *L'alimentazione*, 474. Enclosure clearly resulted in resentment by neighboring populations in the later medieval period as well. In 1294, some Italian peasants attacked the newly-built enclosures of the abbey of San Martino, making a hole in the wall around the woodlot; during litigation the peasants claimed that the wall was preventing them from gaining access to the wood products they had customarily used. See Charles M. de Roncière, "A Monastic Clientele? The Abbey of Settimo, its Neighbors and its Tenants (Tuscany, 1280-1340)," trans. Chris Wickham, in *City and Countryside in Late Medieval and Renaissance Italy: Essays Presented to Philip Jones*, ed. Trevor Dean and Chris Wickham (London: Hambledon Press, 1990), 62.
28. For the size and grandeur of flower gardens as markers of social status, see Cardini, "Il limite,"30-33; Pizzoni, *The Garden*, 22-23; and Bauman, "Tradition and Transformation":136.
29. See Montanari, *L'alimentazione*, 357.
30. *Consuetudinum*, 32. See also Walahfrid Strabo's poem about a monastic garden, the *Hortulus*, written ca. 840 but circulated in the centuries afterward; there, the poet lists all of the plants in an ideal monastic garden, noting the practical utility of each, either culinary or medicinal. Lilies and roses are the only showy flowering plants, appearing as symbols of faith and Christ's passion respectively–yet even these two are said to have immediate medicinal applications as well. See *Walahfrid Strabo, Hortulus*, transcribed and translated by Raef Payne (Pittsburgh, Pa.: Hunt Botanical Library, 1966). Friary gardens, usually in towns, were even more spartan, specializing in trees to supply the friars with firewood. See McLean, *Medieval English Gardens*, 53-54.
31. Statute quoted in Montanari, *L'alimentazione*, 346n.
32. *PL* 70, cols. 1142-43.
33. Thomas of Celano, *Life*, chap. 21 (*Early Documents*, vol. 1, 284); and St. Bonaventure, *Life of St. Francis*, chap. 12 (*Early Documents*, vol. 2, 62). This sermon paraphrases Matt. 6:25 and Luke 12:24; in Thomas's text it forcefully praises extrication from all human economic orders.

34. "Canticle of Brother Sun" (sometimes called "The Canticle of the Creatures"), line 9, in *Early Documents*, 1:114.
35. *Life of St. Francis*, chap. 2, in *Early Documents*, 1:185.
36. For general surveys on the growth of the cities and on how that growth depended on surrounding rural development and the new rural bourgeoisie landowning class, see Gino Luzzatto, *Dai servi della gleba agli albori del capitalismo* (Bari: Laterza, 1966), 157-61 and 207-28; and L. A. Kotel'nikova, *Mondo contadino e città in Italia dall'XI al XIV secolo* (Bologna: Il Mulino, 1975), esp. 19-141. On the close relationship of the *contado* (an Italian city's surrounding agricultural lands, upon which it depends) and the emerging pre-capitalist urban market economy, see Philip Jones, *The Italian City-State: From Commune to Signoria* (Oxford: Clarendon Press, 1997), 171 and 280-81; and Ronald Edward Zupko and Robert Anthony Laures, *Straws in the Wind: Medieval Urban Environmental Law–The Case of Northern Italy* (Boulder, Colo.: Westview Press, 1996), 89-91.
37. On the history of the privatization, the intense cultivation, and the enclosure of land throughout France and Central Europe generally, see Marc Bloch, *French Rural History: An Essay on its Basic Characteristics*, trans. Janet Sondheimer (Berkeley: University of California Press, 1966), 56-63 and 198-213 ; and Georges Duby, *Rural Economy and Country Life in the Medieval West*, trans. Cynthia Postan (Columbia: University of South Carolina Press, 1968), esp. 72-75, 84-86, and 158-65. For Italy, see Giovanni Cherubini, *Signori, Contadini, Borghesi: Ricerche sulla società Italiana del Basso Medioevo* (Florence: La Nuova Italia, 1974), 134-35; Emilio Sereni, *History of the Italian Agricultural Landscape*, trans. R. Burr Litchfield (Princeton, N.J.: Princeton University Press, 1997), esp. pp. 62-106, where the author closely tracks the changing of "open fields" into the "closed fields" of the age of privatization; Denis E. Cosgrove, *Social Formation and Symbolic Landscape* (London and Sydney: Croom Helm, 1984), 71-82; and Luzzatto, *Dai servi*, 214-15. On the fragmented landscapes of the Mediterranean and the intensive productivity made possible only by heavily-managed parcels of land in a "landscape of power," see Peregrine Horden and Nicholas Purcell, *The Corrupting Sea: A Study of Mediterranean History* (Oxford: Blackwell, 2000), esp. 209, 219-20, 236-37, 254-55, and 276. On the agricultural lands owned by Francis's own father, who was a merchant living within the city of Assisi, see Arnaldo Fortini, *Nova Vita di San Francesco* (Assisi: Edizioni Assisi, 1959), 1:142-49 and 2:111-12. For another example of the expansion of city landowning at the time of the rise of the Franciscans, see Chris Wickham, "Rural Communes and the City of Lucca at the Beginning of the Thirteenth Century," in *City and Countryside*, ed. Chris Wickham, 9.
38. Thomas of Celano's position concerning these internal debates is clearer in the *Remembrance* than in the *Life*; the former (i.e., later) work seems to mark him more clearly as a "protospiritual," in that he seems to identify there with those who resisted the order's increasingly relaxed views on private ownership and the accumulation of worldly wealth. For a recent assessment of Bonaventure's more flexible (and thus more practical) views concerning poverty, private ownership of goods, and the order's cooperation with the urban mercantile elite, see Burr, *Spiritual Franciscans*, 16-17.

The Mughal Garden: Gateway to Paradise
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JAMES DICKIE

(Yaqub Zaki)

THE MUGHAL GARDEN: GATEWAY TO PARADISE

Properly speaking, Mughal, which means "Mongol," is in this context a misnomer. "Mughal" refers here to the name of the dynasty founded by Babur after the Battle of Panipat in 1526, which endured, in attenuated form, until 1857. Queen Victoria feloniously crowned herself Empress of India in 1876, at the adroit suggestion of Disraeli, but the style persisted even under alien rule.

First of the Great Mughals—the name applied to the six brilliant emperors who filled the 180 years after 1526 with their glittering achievements—was Babur, who was Mongol on his mother's side and Turkish on his father's. Babur was sixth in the line of descent from Tamerlane, while his mother was descended of Chengiz: thus the blood of Asia's two greatest conquerors conmingled to produce a third, the conqueror of India. Like his near contemporary, Mehmed II, conqueror of Constantinople, Babur was no mere simple soldier but the highly complex product of a complex civilization at its zenith. His *Memoirs*, which have been translated into English by Annette Beveridge, are accounted a literary masterpiece. Lane-Poole, in his biography of Babur, published in 1900, says:

> The line of Emperors who proceed from Babur's loins is no more. The very name of Mongol has lost its fame on the banks of Iaxartes; the Turk is the servant of the Russian he once despised. The last Indian sovereign of Timur's race ended his inglorious career an exile at Rangoon almost within our own memory; a few years later the degenerate descendants of Ghengis Khan submitted to the officers of the Tsar. The power and pomp of Babur's dynasty are gone; the record of his life—the *litterata scripta* that mocks at time—remains unaltered and imperishable.[1]

These *Memoirs* are eminently quotable: "Then" says Babur, "in that charmless and disorderly Hindustan, plots of garden were laid out with order and symmetry, with suitable borders and parterres in every corner and in every border rose and narcissus in perfect arrangement."[2] Babur is referring to his own activities as landscape gardener, but before touching on these a quotation from Yeats's *The Statues* might throw some light on the subject:

> No! Greater then Pythagoras, for the men
> That with a mallet or a chisel modelled these
> Calculations that look but casual flesh, put down
> All Asiatic vague immensities
> And not the banks of oars that swan upon
> The many-headed form at Salamis.
> Europe put off that foam when Phidias
> Gave women dreams and dreams their looking-glass.

What Yeats is doing here is to oppose the rational mind of Europe to the vague, nebulous philosophy of Hinduism ("All Asiatic vague immensities"), and the reason for citing him here is because across four centuries his verses echo Babur's complaint about that "charmless and disorderly Hindustan," which, to make tolerable, he had to plant with gardens exhibiting "order and symmetry." This is precisely the function of art: art organizes reality; by imposing order on the undifferentiated chaos of experience it succeeds in raising it to a higher level of significance, producing in the process, beauty. What emerges from this and other passages in the emperor's *Memoirs* is the image of Babur as *muhandis* (geometer/architect/engineer), Babur as Cartesian almost. The civilization of which Babur was the vehicle was the Timurid civilization of Central Asia. The sensational conquests of his great ancestor over a century before had brought together Central Asia, North India, Persia, Mesopotamia, Syria, and Asia Minor in a single empire with its capital at Samarqand, and subsequently Herat. To his metropolis, Tamerlane transported artists and craftsmen from all over Asia, and there under Arab, Persian, Central Asian, and even Chinese influence Islamic civilization assumed its decisive form.

One art which flourished notably at the Timurid court was the art of landscape design. We know the names of the gardens which adorned Samarqand in the fifteenth century—the Bah-i-Naqsh Jehan, the Bagh-i-Shimal, the Bagh-i-Bihist, the Bagh-i-Boland, the

Bagh-i-Naw, the Bagh-i-Channar, the Bagh-i-Dilkusha, the Bagh-i-Dulday, and the Bagh-i-Jehannuma—but not the reality, because gardening is of its very nature the most transient and evanescent of art forms. Contemporary accounts exist though, notably by the Spanish ambassador Clavijo. The garden type that we think of today as characteristically Islamic is in fact the Timurid garden. What Islamic gardens were like before Timurid times we have little means of knowing and, save for the Hispano-Arab garden, no examples. The scant evidence suffices, however, to prove that a basic pattern prevailed from the shores of the Atlantic to the Bay of Bengal. This tradition, in its Timurid expression, bifurcated, going south to produce the Persian garden and east to produce the Mughal garden. The attempt to introduce the lush gardens of Central Asia into the dusty plains of Hindustan produced a hybrid, or mutation; and this mutation, the Indo-Islamic garden, is still a living art form, as evidenced by the garden Lutyens's coadjutor, W. R. Mustoe, of the Horticultural Department, designed for the Viceroy's House in New Delhi, as well as by the new garden in the Lawrence Gardens (Jinnah Bagh) at Lahore.

The reason the Timurid garden could not be transplanted without suffering transformation is very simple. Central Asia is mountainous country, and the Timurid or Persian garden is laid out on a gentle slope so the water moves through gravity; alternatively, it is disposed on a graduated series of terraces, a solution the Mughals were to adopt wherever feasible, as in Kashmir. In a very penetrating passage, Wilber writes:

> The basic fact was that the gardens of Herat and Samarqand could not be transferred to the Indian plains. The climate was not suitable for orchards and vineyards, which require a cold season to establish a dormant state in the plants and trees. In the mountainous regions the fine gardens had been the outgrowth of the bustan, or orchard, and the concept of the gulistan, or flower garden, matured at a later date. Lacking the possibility of producing dense, productive orchards, the Indian gardens developed towards great open spaces and wide expanses of water."[3]

Nevertheless, certain elements were exportable: the *chaharbagh*, or fourfold plot; the water channels and irrigation system, which, linked to the fourfold plot, produces a formal geometrical grid pattern capable of indefinite extension; also, the disposition of the garden on terraces and disparity in level between the elements of the grid and the flowerbeds they enclose. Most of these components are present in what is practically the only one of Babur's gardens in India to survive, the Ram Bagh, which still exists, albeit more than a little disheveled, on the banks of the Jumna at Delhi. It was in this garden that Babur was buried in 1530, his remains being subsequently translated to Kabul according to his wish.

Since the Ram Bagh is not only the earliest Mughal garden extant but one of the very first ever to have been constructed, despite subsequent modification we may take it as prototypal. Here the paved walkways (*khayaban*) are raised some ten feet above the level of the beds, and since the original planting has perished the reason for this may appear somewhat obscure. Susan Jellicoe contends that the height above the flowerbeds varied according to what was intended to be planted in the garden: thus some gardens were quite shallow while others, like Akbar's garden at Sikandra (plate 1), were very deep.[4] It is essential to understand that the Islamic garden was intended to be looked down upon.[5] But in the latter example steps flanking the *abshar*s, or water chutes, down which the water cascaded from the causeways show that the parterres were designed to be generally accessible. Thus the Indo-Islamic garden operated simultaneously on two levels: visually, on the upper level, as a living carpet; and, sensually, on a lower plane, as a place of shade and intimacy and cool repose. It could only operate visually as a floral carpet or tactually as a refuge from the scorching heat provided the planting was dense. The large painting on linen showing an aerial view of Jehangir's garden at Shahdara at Lahore, now in the library of the Royal Asiatic Society, reveals just how dense the planting was (plate 2).[6] Unfortunately our image of a Mughal garden today is formed by the visual clichés of India Tourist Office posters of the Taj Mahall. We forget the old photographs show it looking quite different, before Lord Curzon gave the neglected gardens the semblance of an English lawn. As such, the cost of maintenance is prohibitive, which is why, apart from the Taj and the Shalimar and Jehangir Baghs in Lahore, no Mughal garden today is properly maintained. Had we but the sense to revert to the Mughal system of gravitational irrigation, whereby the beds are periodically flooded, then the trees and shrubbery would protect the grass with their shade.[7] Volwahsen writes:

> A modern irrigation system could only temporarily stop such vast lawns being scorched by the blazing sun. A genuine Mughal garden, forming an architectonic unit with the mausoleum, could not be maintained today, for the simple reason it would need too much water. As a

Plate 1. Sikandra. Akbar's mausoleum. Mughal tombs look their best from the roof of the gateway. (Unless otherwise stated, all photographs are by the author.)

> result the harsh silhouette of the building stands in too sharp contrast to the green lawns. It was originally envisaged that above a swirling mass of flowers, fruit trees and fountains, situated at different levels, the white dome of the tomb should stand forth, supported by the façades, with their red and white casing; in this way there would be a masterly transition from the many-coloured diversity of the garden to the simple symbolism of the marble dome.[8]

It helps if we try to imagine the Taj as it was originally intended to be seen: one would catch glimpses of the dome above fronds and branches; and with the oranges hanging like globes of fire amidst the rich green foliage against the peerless white dome the effect of such beauty must have been almost painful.

Transition in level in a Mughal garden is effected by the *abshars*. Since the Muslim mind apprehends reality in terms of pattern, the surface of the water chute is inlaid with chevrons to emphasize the movement of the water, or carved in a fish-scale pattern to produce a rippling, corruscating effect; in a word, the water becomes a liquid arabesque. Thus the water links dynamically the two levels; the upper, or tectonic; the lower, or vegetal. Jellicoe stated at the Dumbarton Oaks symposium in 1974 that in a Mughal garden the water is perhaps even more important than the soil. It is difficult to quarrel with this conclusion: the mobile qualities of water modify the different spatial relationships that exist between the various parts of the garden, emphasizing and, at the same time, loosening the rigidity of the plan. The soil is static, as is the stonework, while the water and the plants are kinetic, but in the garden their relationship becomes symbiotic. Where the causeways intersect there can be either a pool or fountain, or both combined, or a *chabutra*, a stone or brick platform. The chabutra serves to provide an elevation for the throne, raising its occupant above the level of common humanity. Alternatively, it may serve as a plinth (*kursi*) for a

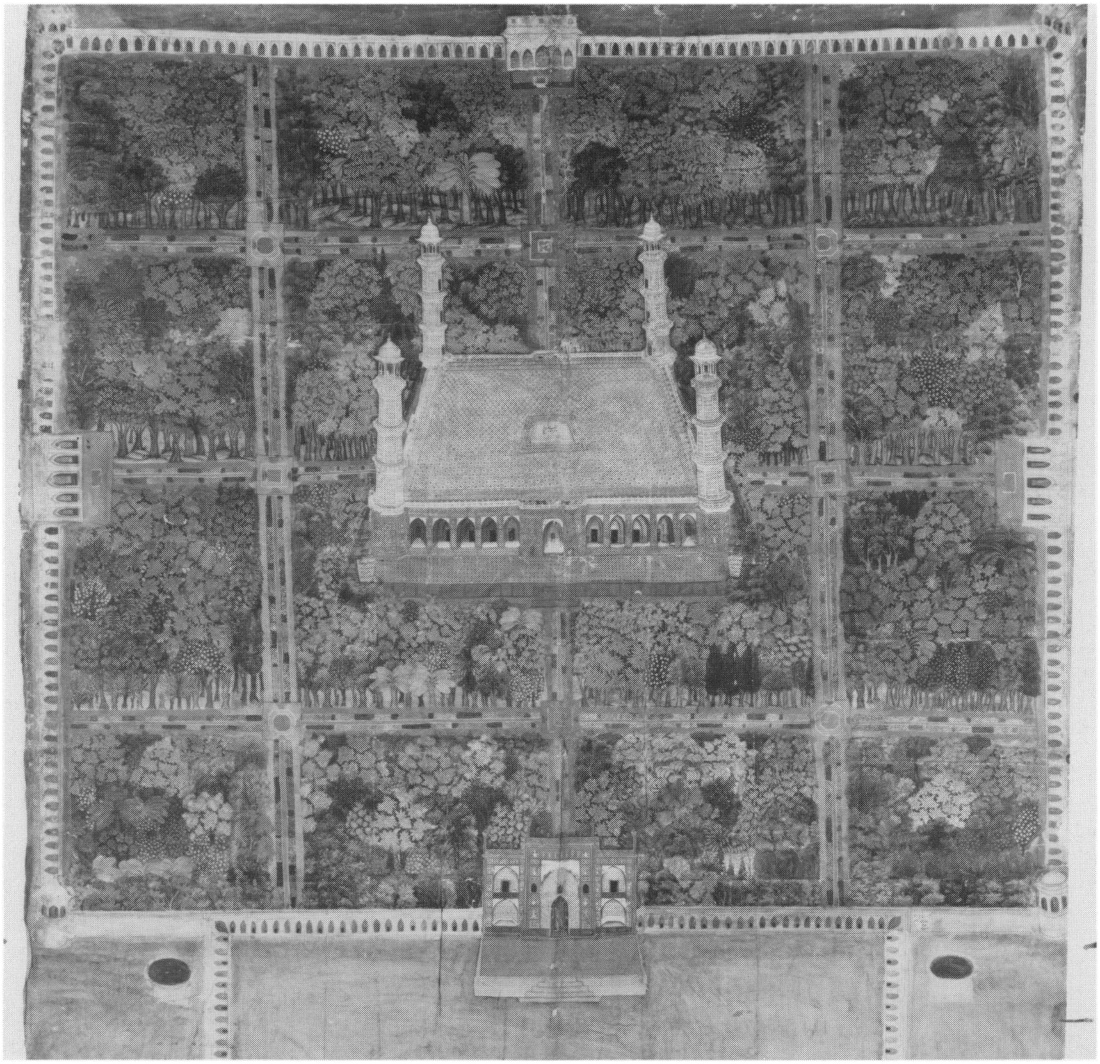

Plate 2. Lahore, Shahdara. Bagh-i Dilkusha (funerary garden of Jehangir). Eighteenth-century representation on linen. (Photo: courtesy Royal Asiatic Society, London.)

baradari, or open-sided pavilion. *Bara* means twelve and refers here to a three-by-three module in which four walls are each pierced with three doors. The lateral openings can be converted into windows by the insertion of *jalis*, perforated stone or marble screens which admit light and air but temper the brilliance of the former by filtering it. As the light penetrates a jali it projects the same image in shadow on the floor or opposite wall, so that, like water passing over an abshar, light becomes a medium for pattern. The pavilion crowns the axes triumphantly, so that the axes intersect within the baradari; at the precise point where they cross is the spot on which the fortunate owner of such a demesne often elects to be buried.

Properly to understand the notion of burial in a garden, we have to site it within an eschatological framework. Islam conceives of paradise as a garden, the Koranic term being *al-janna*, i.e., *the* Garden, the garden *par excellence.* Burial in a garden amounts to a material anticipation of immaterial bliss, and the closer the garden approximates the Koranic model the more effective is the analogy. A Mughal garden, populated

with nard-anointed houris and the air balmy from the perfume of too many flowers, must have approximated the divine archetype pretty closely. So much for the principle, but with reference to the particulars of the custom one could hardly do better than quote from Fergusson:

> The usual procedure for the erection of these structures is for the king or noble who intends to provide himself with a tomb to enclose a garden outside the city walls, generally with high, crenellated walls, and with one or more splendid gateways; and in the centre of this he erects a square or octagonal building, crowned by a dome, and in the more splendid examples with smaller, dome-roofed apartments on four of the sides or angles, the other four being devoted to entrances. This building is generally situated on a lofty square terrace, from which radiate four broad alleys, generally with marble-paved canals, ornamented with fountains; a mosque is an essential adjunct; the angular spaces are planted with cypresses and other evergreens and fruit trees, making up one of those formal but beautiful gardens so characteristic of the East. During the lifetime of the founder, the central building is called a Bara-dari, summer house or festal hall, and is used as a place of recreation and feasting by him and his friends.
>
> At his death its destination is changed—the founder's remains are interred beneath the central dome. Sometimes his favourite wife lies with him; but more generally the family and relations are buried under the collateral domes. When once used as a place of burial its vaults never again resound with festive mirth. The care of the building is handed over to priests and faquirs, who gain a scanty subsistence by the sale of the fruits of the garden, or the alms of those who come to visit the last resting-place of their friend or master. Perfect silence take the place of festivity and mirth. The beauty of the surrounding objects combines with the repose of the place to produce an effect as graceful as it is solemn and appropriate.[9]

Elsewhere I wrote of such places that when "a mausoleum stands in isolation within a funerary garden the effect is incomparable: aesthetically and conceptually, it transports the beholder to the frontier of emotional experience."[10] The funerary garden is Islam's answer to the grim realities of death. Horace Walpole, extolling the beauties of the mausoleum at Castle Howard, said that it "would tempt one to be buried alive"; and of the cemetery of the Acattolici in Rome Shelley wrote that it "might make one in love with death, to think that one could be buried in so sweet a place." The latter sentiment is closer to the Islamic: wandering about in these places, sense impressions proceeding from colors, sounds, and perfumes, and even such things as the sight of parakeets flying among the trees, crowd in upon one and so work upon the mind that death comes to seem attractive even. In a bid at a further dimension of experience, odoriferous plants such as jasmine figure prominently in the overall planting scheme, as the sense of smell is notoriously evocative, the merest suggestion of a particular scent being sufficient to set in motion an entire train of associations.

Certain phrases in Fergusson's description call for comment. Burial under collateral domes explains the ground plan of the Taj, which goes back to a Central Asian prototype, whose lineal descendant in Persia is the Hasht Bihisht palace in Isfahan. The model for the Taj was of course Humayun's tomb,[11] but the plan of Iᶜtimad al-Daula's tomb, which belongs to another type, the tiered mausoleum, incorporates the same provision for subsidiary burial. It is highly probable that such buildings were intended as dynastic mausolea, exactly like Augustus's mausoleum at Rome. The reference to the economics of the garden makes an important point: horticulture was unknown in India before the Muslim invasion, and the funerary garden is necessarily an autarchic concept, since its purpose is to perpetuate a memory *indefinitely*. Every tomb requires a *mujawir*, or custodian, who, with his family, lives off the produce of the surrounding garden. The idea of the garden as something ornamental and afunctional came in with the Renaissance; the ancient world had no conception of the garden as presently understood. Islam remains faithful to the older and Roman idea of the *hortus*.

At one time such gardens proliferated outside every Mughal city; they stretched along the banks of the Jumna at Agra and Delhi, while in Lahore they flanked the banks of the Ravi and lined the Grand Trunk Road as it approached the walled city (plate 3). For Kashmir, where three great royal gardens survive, sources give the somewhat improbable figure of 777.[12] Funerary gardens are also to be found at Allahabad and Aurangabad. But perhaps the best place to see the sort of thing Fergusson is thinking of is Agra, where on the

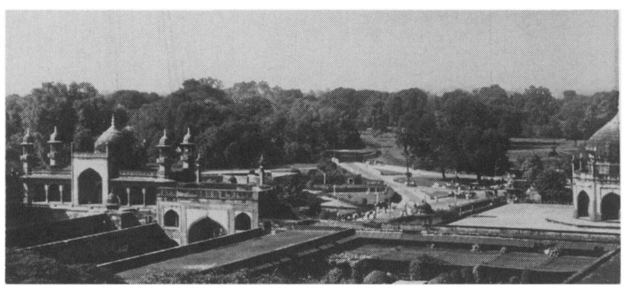

Plate 3. Agra. Funerary gardens lining the left bank of the Jumna. View taken from the gateway of the Taj.

outskirts of the city magnificent masterpieces of Islamic architecture crumble to decay. In one case the floor of the pavilion has collapsed, and one can look straight down into the vault, disclosing the burial, marked by a *taʿwiz*. In Agra, to a degree inconceivable in Delhi, which was ruined by the transfer thither of the capital from Calcutta, the visitor is particularly conscious of departed glory: washed by the tides of history, these waters have since receded with the result that the wrecks of former grandeur bestrew the environs (plates 4-5). The reason why gardens were located on the banks of rivers is simple: water was raised to the level of the enclosure wall by a Persian wheel standing on the bank; thence by an aqueduct the water was conducted to the garden, where it ran along the top of the wall in a system of terra-cotta pipes. This procedure produced the head of water necessary to work the fountains.

Over the entrance to Akbar's garden at Sikandra is written: *These are the gardens of Eden: enter them to dwell therein eternally*, which shows that Islam views history as a circular process of restoration. Once inside this garden, one is aware that more than one tradition has been at work. The basic scheme is the fourfold plot introduced by Babur: a square or rectangular area is divided into four quadrants by two axes (or the principal axis in the case of a rectangular area) which carry the water for the

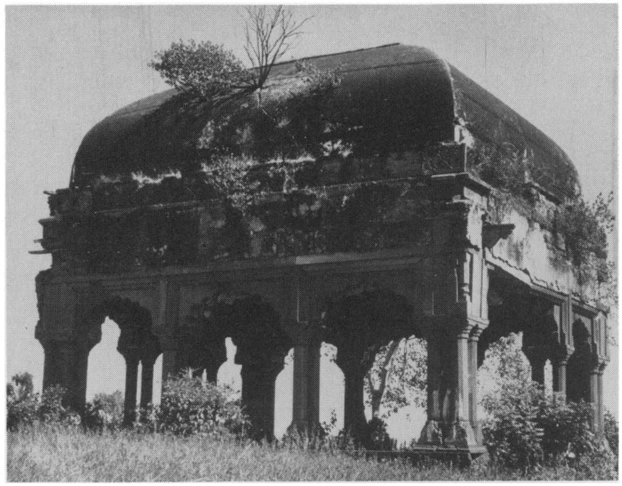

Plate 5. Agra. Another ruined tomb on the outskirts of town. Collapsed floor enables one to see right into the vault, showing the duplicative principle in burial introduced from Central Asia by the Mughals.

Plate 4. Agra. A ruined tomb on the outskirts, the sole relic of a vanished funerary garden such as Fergusson describes.

irrigation of the garden under gravitational pressure from the raised walks. Depending on the area to be enclosed the quadrant can be divided or subdivided indefinitely so that the same module is repeated on different scales. Viewed in Jungian terms, this approximates to a mandala, an archetype that predates Islam. In Persian ceramics datable approximately to 4,000 B.C. the world appears as a bowl divided into quadrants, with the Spring of Life at the center, whose waters flow out to fertilize the four quarters of the globe. This is the basic plan of the Islamic garden, except that in the latter a pavilion has supplanted the spring. This pre-Islamic, but Islamized, scheme has much in common with another, which is Vedic: in Aryan villages two diagonal thoroughfares intersected at a spot marked by a tree, underneath which the elders sat; the quarters served to separate the castes. In Hindu mythology this tree, the Tree of Knowledge, with Naga, the holy watersnake, coiled around its roots, springs from a mound; the mound is the Mount of Meru, down whose slopes, from a hidden spring, water runs out to the four cardinal points. The same tree appears as a stone umbrella (*chahtri*) atop Buddhist stupas. At Sikandra the entire garden is laid out on a cosmic cross, with the four entrances facing the cardinal points and the tiered tomb at the center replacing the mountain.[13] Other artificial mountains like Anghor Vat and Borobudur are similarly oriented, but that is because

the Buddha faced east at the moment of the enlightenment: here it is because the qibla axis, the determinant of burial in Islam, is due west (plates 1, 6).

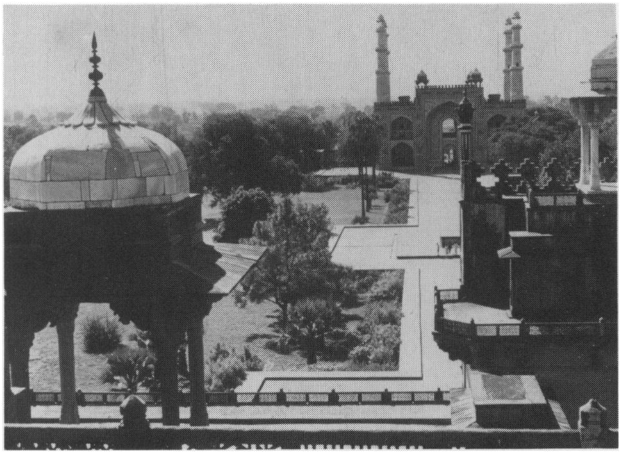

Plate 6. Sikandra. Reverse view of Akbar's mausoleum (plate 1), looking from one of the upper tiers of the mausoleum back toward the gateway.

It would be a mistake to think that all Mughal gardens were destined sooner or later to be places of sepulture. The garden in Islam embraces living space for the quick as well as the dead; indeed Islam conceives of a palace only as a series of pavilions interspersed with gardens linked to one another within an overall horticultural scheme. In an idealized, bird's-eye view of an eighteenth-century palace at Lucknow in the David Collection at Copenhagen, one sees plainly the interlocking functions of palace and garden: each has invaded the other's space; a mutual compenetration is the result (plate 7). In the Anguri Bagh, or grape garden, in the Fort of Agra, within each of the four parterres there is an intricate pattern of small interlocking beds outlined by sandstone curbs; each bed was reserved for a specific bloom, and with the curbs to control the situation, the limit of each color appeared clearly demarcated within an overall pattern of carefully calculated tonalities. Thus the Anguri Bagh was in reality a floral carpet spread at the feet of the emperor as he sat in the Khas Mahall and looked out over the courtyard. This garden also retains some of its original fence (in red Mathura sandstone), the only one of its kind to survive in India, or indeed anywhere, although at one time it was ubiquitous, as we know from Clavijo as well as from miniatures depicting garden scenes, where the cinnabar paling forms a conspicuous feature.[14]

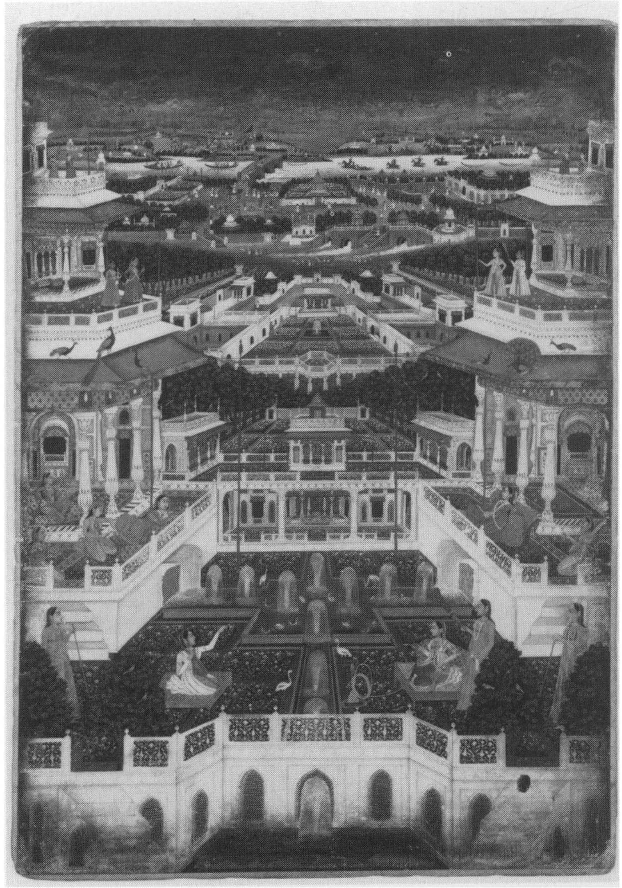

Plate 7. Aerial view of an imaginary palace at Lucknow, painted 18th century. (Photo: courtesy David Samling, Copenhagen.) Note mausolea and mosque lining the riverbank, exactly as described on pp. 132-33.

A particularly attractive garden of the type under discussion figures in a manuscript of the *Khamsah* of Nizami, dated 1595. Laila and Majnun are shown carousing in a temporary pavilion atop a Mughal fort tower overlooking a chahar-bagh, with a fountain and four dwarfed cypresses planted in confining basins and with fruit trees trained to grow around the trunks. Taking artistic license with his subject, the artist has made the wall invisible so as to afford us a glimpse of an underground pump worked by two oxen which feeds an external cistern. From there the water is conducted to a pavilion, which is the distribution point (*taqsim*) of the water system of the entire palace; the visible arrangement of tanks and channels is only part of the picture (plate 8).

Plate 8. Miniature depicting domestic garden, dated 1595. (Photo: by permission of the British Library.)

Such gardens are of necessity restricted by the domestic scale as well as the exigencies of urban planning, but *extra muros* there exist gardens of vast extent intended for only temporary occupation. An excellent little booklet by Dr. Dar, Director of the Lahore Museum, entitled *Some Ancient Gardens of Lahore*, distinguishes four kinds of garden: (a) gardens attached to palaces or *havelis*; (b) gardens which serve as substitute royal residences, for the emperor to put up at when on a journey; (c) funerary gardens surrounding purpose-built mausolea; and, lastly, (d) pleasure gardens with baradari in the middle, the commonest category.[15]

As observed earlier, the pleasure garden ultimately becomes a funerary garden, with the baradari adapted to its new function. The second type remains to be discussed. A good example, complete with baths and towers for the ladies of the Zenana to look out over the countryside, is the Shalimar Bagh at Lahore. Unfortunately this garden is now entered from the top instead of the bottom, by a postern of British date giving onto the G.T. Road. The real entrances are on the lowermost terrace, which means that today the terraces are visited in the reverse order and the aesthetic effect is lost, because one is meant to walk up to an abshar, not come upon it suddenly from above. A huge abshar connects the second and third terraces, and its waters flowed out underneath the imperial throne, cooling the person of the monarch as they did so, for the royal passions must have been not a little inflamed by the gyrations of the nautch-girls on the dancing platform. This platform stands in the middle of the huge tank which occupies the whole of the second terrace (plate 9). Connecting the second terrace with the third is a *sawan bhadun*, more sensational still. This takes the form of a waterfall falling down three sides of a roofless "room," which is open on the fourth side. The walls are composed of serried rows of niches in each of which, during festivities, a candle burned behind the falling water. The candles were camphorated so that sight, sound, and smell bombarded one's senses simultaneously, producing a multisensory response.

After the death of Aurangzebe in 1707 the Mughal regime was too impoverished to command gardens on this scale, but a century before the final debacle Qudsiyya Begum, wife of Emperor Muhammad Shah and mother of the unfortunate Ahmad Shah, laid out her own garden, the Qudsiyya Bagh, just outside the Kashmir gate at Delhi, in 1748. As observed before, Mustoe designed a stunning garden, not improved, I think, by Lutyens's intervention, at the viceregal residence in New Delhi.[16] On a more modest scale, a small garden has been recently laid out adjacent to the Great Mosque of Delhi for the burial of Abu'l-Kalam Azad, to whom the spot was endeared on account of its associations, namely the site of the execution of the *exalté* Sarmat. Based on the intersection of two asymmetrical axes, with two arches intersecting over the tomb, this garden is a modern reinterpretation of the traditional funerary garden, complete with lily pond and solemn cypresses lining the approach to the grave. Recently in Pakistan an attractive garden in the Mughal style was laid out in Lawrence Gardens at

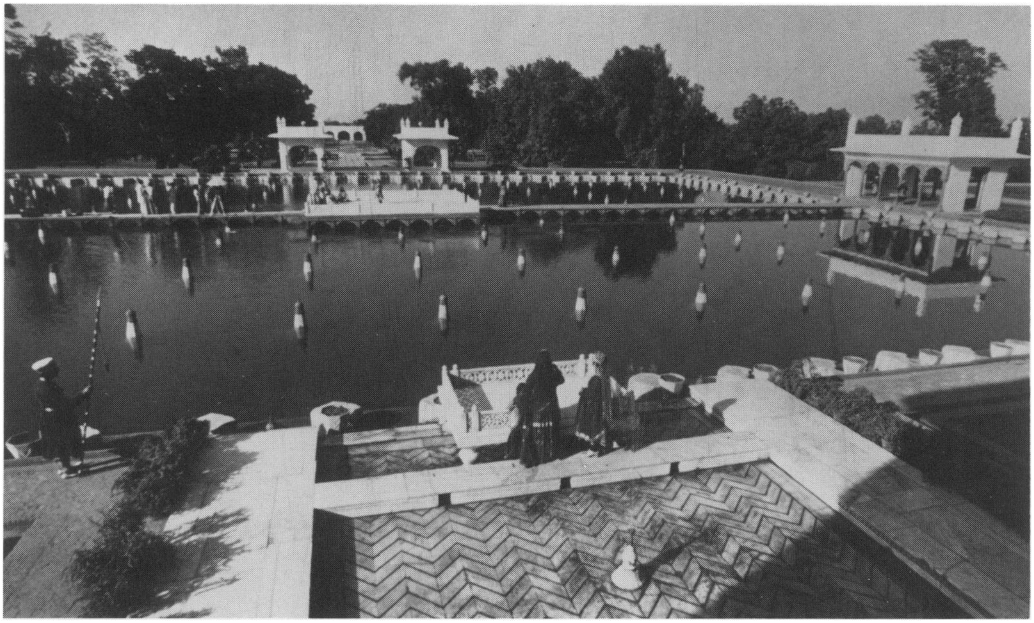

Plate 9. Lahore. Shalimar Bagh. Photographed during the reconstruction of a Mughal fête, 1975.

Lahore. Some might argue that the time and energy expended might have been better used to restore one of the ruined historical gardens in which that city abounds. In Mughal times there were some fifty gardens in Lahore, of which one was the largest garden in the world.[17] This was the circular (*gol*) garden at the foot of the city walls. Probably no more than a dozen of these sites can be traced today and only two—Jehangir's garden and the Shalimar Bagh—are relatively intact. The gardens, and particularly the Gol Bagh, which encompassed the town with a five-mile belt of greenery, were the lungs through which the city breathed, for Lahore, unlike other Indo-Islamic cities, never knew the courtyard house and in Shah Jehan's time the city must have been a healthier place than it is today. The Chauburji garden, second in size only to the Shalimar—the Gol Bagh being *sui generis*—is still restorable, the site being yet unbuilt upon, unlike the Gol Bagh, which existed as late as 1947.

What hopes can be entertained for the future of the Mughal garden, both for the survival of the art form and the conservation or restoration of historic examples? Today, as a result of overpopulation and urban development policies, whose rationale is sometimes difficult to fathom, it would perhaps be no exaggeration to say that the monuments of Lahore are under greater threat than at any time since Ranjit Singh. Across the frontier in India the situation is no better. A few years ago an expert on Japanese garden design, one Mr. Mori, was called in by the federal government to advise on a suitable site in the nation's capital for a Japanese garden. Unbelievably, the site settled on was an already existing garden, the Roshanara Bagh, the work of Aurangzebe's favorite sister, Roshanara Begum. Plans allow for the construction of a restaurant on an island, a pond, waterfalls, brooks, shelters, rockwork and Japanese-style landscaping—all on a Mughal site! Conservationists do not get much of a hearing in Third World countries; and it is only by ventilating the issues the problems of conservation raise in publications such as this that timely steps can be taken to avert tragedy such as that which threatens to overwhelm the Roshanara Bagh.

London, England

NOTES

1. Stanley Lane-Poole, *Babar* (Oxford, 1899), pp. 15-16.
2. *The Babur-nama in English*, trans. Annette P. Beveridge (London, 1912-22), fasc. 3., p. 532.
3. Donald Wilber, *Persian Gardens and Garden Pavilions* (Tokyo and Rutland, Vt., 1964), p. 76.

4. This was the response to a point raised by the present writer at the Dumbarton Oaks Symposium on Islamic gardens, Washington, D.C., April 1974. For Susan Jellicoe's paper, see "The Development of the Mughal Garden," in Elizabeth MacDougall and Richard Ettinghausen, eds., *The Islamic Garden* (Washington, D.C., 1976), pp. 107-29.
5. This much was clear to Clavijo when visiting a garden near Samarqand in the fifteenth century "... e por medio destas calles y arboles ibam unos andenes que travesaban toda la huerta; y en medio desta dicha huerta estaba un cerro alto de tierra que fue echada a mano alli en deredor de vergas de madera; y destas calles iban otras muy comarcadas que se podrian bien andar por ellas e mirar toda la huerta...." ("... and among these causeways and trees were pathways which crossed the entire orchard; and in the center was a high hill composed of earth thrown up by hand within a palisade of wooden stakes; and linked to these walkways were others, lined with trees, *from which the whole orchard was visible* ..."). For the purposes of this study, I have made my own translations from Clavijo using the Madrid edition of 1943, Rodriguez González de Clavijo, *Embajada a Tamorlan*, ed. Francisco Lopez Estrada (Madrid, 1943); Eng. trans. by Guy le Strange, *Embassy to Tamerlane, 1403-1406* (Broadway Travellers Series, Cassell: London, 1928). Le Strange (p. 216), working on the St. Petersburg edition of 1893, has produced a somewhat different version of this passage.
6. A well-researched paper by J. P. Thompson, "The Tomb of the Emperor Jahangir," *Archaeological Survey of India Annual Report*, 1910-1911, pp. 12-30, establishes clearly what was on the second story of Jehangir's tomb: a simple platform enclosed by jalis, with a cenotaph, or duplicate tomb, in the middle. On the RAS painting the area in question is covered by a label reading "Maqbarat-i-Badshah Jehangir" (burial place of Emperor Jehangir). If this label could be removed there is little doubt that it would disclose a *taᶜwiz*, thereby vindicating Thompson's hypothesis. This brilliant piece of research is not nearly so well know as it deserves to be, witness the visual blunder perpetrated by Volwahsen on p. 85 of *Living Architecture: Islamic Indian* (London, 1970). The painting is presumably of the Ranjit Singh period, as it was donated to the society on November 17, 1849 by General Sir Claude Martin Wade, who had been in Lahore from 1823.
7. We must rely for evidence not only on paintings and the miniatures, which are a more reliable guide to how these gardens looked in their prime than is any extant garden, but on carpets. Garden carpets from Persia show a *chenar* (Oriental plane) planted in each corner so that it might protect the more delicate plants with its plenteous shade. Thus four chenars, one to each corner, would account for a significant area of each flowerbed, the more so since the corners were often finished off diagonally. It is probably to these trees that Clavijo (p. 154) alludes with the phrase, "... e avia unos arboles grandes e may altos que hacian muy grand sombra...." ("... and there were some large and very tall trees which produced very great shade..."). Also, referring to yet another garden, Clavijo (p. 163) says: "...e esta huerta es grande mucho, e en ella abia muchos arboles frutales e de ofros que hacian sombra...." ("... and this orchard is very big, and in it there were many fruit trees as well as others producing shade..."). See le Strange, *Embassy to Tamerlane*, pp. 216 and 227.
8. Volwahsen, *Living Architecture*, pp. 93-94. For a fuller account of the frame of reference within which the funerary garden operates, s.v. "Rauḍa" in *Dictionary of the Middle Ages* (in press).
9. James Fergusson, *History of Oriental Architecture* (London, 1910), 2:289-90.
10. "Allah and Eternity: Mosques, Madrasas and Tombs," in George Michell, ed., *Architecture of the Islamic World* (London, 1978), p. 47.
11. Volwahsen also points out (*Living Architecture*, pp. 83-84) Khan Khanam's tomb in Delhi.
12. See *Imperial Gazetteer of India*, vol. 15 (Oxford, 1908), p. 93.
13. I hasten to disclaim any originality for these comparisons, which are almost all to be found on pp. 45-46 of Constance Villiers Stuart's *Gardens of the Great Mughals* (London, 1913). Mrs. Stuart, whose pioneer work in this field is beyond praise, would seem to have got many of these ideas from the Maji Sahiba of Bharatpur, to whom she acknowledges her indebtedness in the preface (p. xi).
14. Clavijo, *Embajada a Tamorlan*, p. 163; le Strange, *Embassy to Tamerlane*, p. 227.
15. S. F. Dar, *Some Ancient Gardens of Lahore* (Lahore, 1976), p. 6.
16. This garden is the object of an as yet unpublished study by Dr. Vivian Rich of Victoria, B.C., Canada (personal communication). There is, however, a feature ("This Stupendous Creation") published with lavish illustrations in *House and Garden* (British edition), March, 1985, pp. 144-47.
17. Lest this be deemed a notional figure, begotten of exaggeration and a partial imagination, I subjoin a list lifted from Dr. Dar's booklet:
Pre-Mughal Gardens: Bagh-i-Malik Ayyaz; Bagh-i-Zanjani, Bagh Shah Ismaᶜil; Bagh-i-Qutb al-Din Aibak; Bagh-i-Shah Kakuchisti, Bagh-i-Daulatabad.
Mughal Gardens: (i) Babur and Humayun period: Naulakha Bagh; Bagh-i-Kamran. (ii) Akbar period: Bagh Dilafroze; Bagh-i-Khan-i-Azam; Bagh-i-Andjan; Raju Bagh; Bagh Malik Ali Kotnal; Bagh Mirza Nizam al-Din Ahmad; Bagh Zain Khan Kokaltash. (iii) Jehangir period: Bagh Mirza Muʾmin Ishaq Baz; Bagh Shams al-Din; Bagh-i-Anarkali; Bagh-i-Dilkusha (funerary garden of Jehangir). (iv) Shah Jehan period: Faʾid Bagh; Bagh Bilanal Shah, Shalimar Bagh; Bagh Hoshiar Khan; Bagh-i-Badr al-Din Shah ᶜAlam Bukhari; Bagh-i-Hadrat Sayyid Mahmud; Chauburji Bagh; Bagh-i-Asaf Jah; Bagh-i-Nur Jehan; Parviz Bagh; Mushki Mahall (funerary garden of Nawab Mian Khan); Bagh Abu'l-Hasan; Bagh Khwaja Ayyaz; Bagh Nusrat Jang Bahadur; Bagh-i-Ishan; Bagh ᶜAli Mardan Khan. (v) Aurangzebe period: Gulabi Bagh; Bagh-i-Mahhabat Khan; Bagh Shah Chiragh; Bagh Mullah Shah Badakshi. (vi) Late Mughal period: Bagh Begum Jan: Badami Bagh; Bagh Pir Muhammad Adalti; Bagh Mir Manno (or Bagh Nawab Jani); Bagh Sayyid ᶜAbd Allah Khan; Gol Bagh. (vii) Other Mughal gardens: Bagh-i-Dilkusha; Bagh-i-Dilaram; Bagh-i-Dilamiz; Anguri Bagh; Anar Bagh (Dar, *Ancient Gardens of Lahore*, p. 6.).

COSMETICS IN ROMAN ANTIQUITY: SUBSTANCE, REMEDY, POISON

ABSTRACT: *Mention of ancient makeup, allusions to its associations, and its connection to female beauty are scattered throughout Latin literature. It may seem a minor, even unimportant concern, but nonetheless one from which we may recover aspects of women's historical experience and knowledge of women as cultural actors. The present study is concerned solely with cosmetics and what impact they may have had on women's realities and on perceptions of women. Although the evidence I collect and present here is mainly literary, evidence of material remains is given where possible. This study is intended as a detailed look at cosmetic substance.*

Mention of ancient makeup, allusions to its associations, and its connection to female beauty are scattered throughout Latin literature.[1] It may seem a minor, even unimportant concern, but nonetheless one from which I believe we may recover aspects of women's historical experience and knowledge of women as cultural actors. Adornment and cosmetics may be accounted both as significant aspect of some women's lives and, much like prostitution, a field of "intentional female activity."[2] As scholars have pointed out, "the use and prestige of cosmetics crossed economic boundaries." A woman did not need to be wealthy to wear perfumes or cosmetics: some inexpensive pyxides were made of wood, the blown glass used to hold unguents was cheap, and most substances used for cosmetics and scents (or substitutes for

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[1] The modern bibliography on ancient Roman cosmetics is growing: see A. Ambrosio, *Women and Beauty in Pompeii* (Los Angeles 2001); M. Dayagi-Mendels, *Perfumes and Cosmetics in the Ancient World* (Jerusalem 1989); R. J. Forbes, "Cosmetics and perfumes in antiquity," in *Studies in Ancient Technology* (Leiden 1965) 1–50; P. Green, "*Ars Gratia Cultus*: Ovid as Beautician," *AJP* 100 (1979) 381–92; T. J. Leary, "That's What Little Girls Are Made Of: the Charms of Elegiac Women," *Liverpool Classical Monthly* 15 (1990) 152–55; A. Richlin, "Making Up a Woman: the Face of Roman Gender," in W. Doniger and H. Eilberg-Schwartz, eds., *Off with Her Head: The Denial of Women's Identity in Myth, Religion, and Culture* (Berkeley 1995) 185–213; G. Rosati, *Ovidio: I cosmetici delle donne* (Venice 1985); P. Virgili, "Acconciature e maquillage," *Vita e Costumi Dei Romani Antichi* (Rome 1989); P. Virgili, *Bellezza e Seduzione nella Roma Imperiale,* Palazzo dei Conservatori 11 Giugno–31 Luglio 1990 (Rome 1990); M. Wyke, "Woman in the Mirror: the Rhetoric of Adornment in the Roman World," in L. Archer et al., eds., *Women in Ancient Societies: An Illusion of the Night* (New York 1994) 134–51; and M. Wyke, *The Roman Mistress: Ancient and Modern Representations* (Oxford and New York, 2002) 115–54. See also J. P. V. D. Balsdon, *Roman Women: Their History and Habits* (New York 1962); A. T. Croom, *Roman Clothing and Fashion* (Stroud, Glos, and Charleston, S.C., 2002) 123–24; D. E. E. Kleiner and S. B. Matheson, eds., *I Claudia: Women in Ancient Rome* (Austin 1996) 161, 165–66; and A. Sharrock, "Womanufacture," *JRS* 81 (1991) 36–49. Most recently this subject has been covered by M. Saiko, Cura dabit faciem: *Kosmetik in Altertum-literarische, kulturhistoriche, und medizinische Aspekte*, Bochumer Altertumswissenschaftliches Colloquium 66 (Trier 2005). A fuller treatment of this topic may be found in K. Olson, *Dress and the Roman Woman: Self-Presentation and Society* (London 2008) 58–79.

[2] R. Flemming, "*Quae Corpore Quaestum Fecit:* the Sexual Economy of Female Prostitution in the Roman Empire," *JRS* 89 (1999) 39.

them) were widely available.[3] Because of the noteworthy role played by adornment in the lives of ancient women, the present study is concerned solely with cosmetics and what impact they may have had on women's realities (as far as that is possible) and on literary perceptions of women. It does not explore the ways in which images of made-up women informed political systems or rhetoric.[4]

While the catalogue of literary evidence I present here is somewhat large, and may seem to be an undiscriminating list of material (or verge on the antiquarian), such a inventory is necessary for two reasons. First, this study is intended as a much more detailed look at cosmetic substance than has been advanced in English before. I hope that such a collection of evidence will contribute to the picture of women's lives in Roman antiquity, as far as that is possible, by underscoring the sheer number of substances used as cosmetic preparations. Secondly, such a list contributes to the overall argument of the paper: all substances utilized as cosmetics had other uses, and most of these substances were at once literal (and figurative) poison and remedy. Altogether I hope to arrive at a more or less positive picture of female adornment in Roman antiquity. Eve D'Ambra has done much valuable work in the area of adornment and female status,[5] but the present study attempts more comprehensive detail in the area of cosmetic materials. After a look at sources and method, we will go on to examine different kinds of substances used by women on the skin.[6]

I. Sources and Method

The spatial and temporal parameters of this article have been restricted to a study of the women of Italy, during what has been termed "the central period" in Roman history;[7] that is, roughly 200 B.C.E. to 200 C.E. This may seem a long period of time, but there is a serious lack of connected exposition on the subject in ancient texts, and the problems of using male-authored texts to piece together

[3] Kleiner and Matheson (above, n.1) 164 and n.118. Cheap cosmetics may have been popular, however, because the aura of makeup was one of "exclusivity and social status" (K. Peiss, "Making Faces: the Cosmetics Industry and the Cultural Construction of Gender 1890–1930," *Genders* 7 [1990] 144).

[4] On these, see Richlin (above, n.1); Wyke, "Mirror" (above, n.1) and *Mistress* (above, n.1) 115–54; and T. P. Wiseman, *Clio's Cosmetics* (London 1979) 3–8.

[5] See E. D'Ambra, "The Calculus of Venus: Nude Portraits of Roman Matrons," in N. Kampen, ed., *Sexuality in Ancient Art* (Cambridge 1996) 219–32; and "Nudity and Adornment in Female Portrait Sculpture of the Second Century A.D.," in D. E. E. Kleiner and S. B. Matheson, eds., *I Claudia II: Women in Roman Art and Society* (Austin 2000) 101–14.

[6] Although the evidence collected and presented here is mainly literary, evidence of material remains is given where possible. Perfume and hairstyles are not included, due both to considerations of space and to the fact that they are entirely disparate subjects.

[7] K. R. Bradley, *Slavery and Society at Rome* (Cambridge 1994) xi, 6; and P. A. Brunt, *The Fall of the Roman Republic and Related Essays* (Oxford 1988) 9–12. We should also be alive to the possibility that women of different regions utilized cosmetics in different ways, although that is not the focus of this paper.

women's lives are well-known.[8] Thus, I have used as evidence a number of disparate sources which I believe reflect something of the social history and cultural mores of the period: the expected satirists and erotic poets, but also moralists, historians, and (on occasion) later lexicographers and antiquarians.

To employ such a mosaicist approach,[9] which utilizes and extracts information from many different types of sources to reach a hypothesis, may seem intellectually indefensible. But juxtaposing many genres may give us more information regarding the subject at hand, and taking stories, anecdotes, and bits of text "out of context" and examining them together may result in patterns which would be invisible if the pieces remained scattered in their more conventional places.[10] Combining genres has an added bonus, which is that because many of the representations are inconsistent, using a mosaicist approach can help highlight interpenetration and interplay amongst sources. Thus, Suzanne Dixon maintains that the history of women in antiquity "requires such combinations" of authors and genres, which can add to a richness of textual detail.[11]

The most important caveat in using such an approach is that authors write with different intentions and attitudes. It is essential that we remain conscious of the differences amongst genres. And, as Suzanne Dixon reminds us, it is important to distinguish between information about women's lives and information concerning dominant masculine attitudes to women in the sources.[12] The extraction of facts is mainly what concerns us here, but of course such information may be colored and biased by those same masculine attitudes. This is especially true of cosmetics, which were long suspected in traditional morality as being aesthetically deceptive, repellent, and indicative of sexual immorality.[13] The "anti-cosmetic tradition"[14] seems to provide us with information on many substances used by women as cosmetics, but we must be aware that most of this information comes from satirical or moralistic works, sometimes savagely so, and that such texts may not provide us with unmediated access to women's lives.

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[8] On which see, for instance, V. French, "What is Central for the Study of Women in Antiquity?" *Helios* 17 (1989) 213–20. Flemming (above, n.2) 39 characterizes the evidence as "scarce and slippery evidential resources of a literature produced by men of the imperial élite for their own particular purposes." But French (216) states: "[F]or so poorly documented an area, it seems to me foolhardy to rule any evidence out of court on the grounds that it was male authored and remains largely male-authorized."

[9] The term is from C. Barton, *The Sorrows of the Ancient Romans: The Gladiator and the Monster* (Princeton 1993) 5–6.

[10] Barton (above, n.9) 5–6.

[11] S. Dixon, *Reading Roman Women: Sources, Genres, and Real Life* (London 2003) 12, 21.

[12] Dixon (above, n.11) 16–20.

[13] On cosmetics as suspicious, see B. Grillet, *Les femmes et les fards dans l'antiquite Grecque* (Lyon 1975) 97–114; Rosati (above, n.1) 9–20; and R. Gibson, ed., *Ovid*, Ars Amatoria *Book 3* (Cambridge 2003) 21–25 and 174–91.

[14] Gibson (above, n.13) 174.

In addition, statements concerning makeup in the literary sources may be inaccurate or incomplete, if only because it may be assumed that close examination of cosmetic substance and how it was employed was not a priority for most Roman authors.[15]

Scholars have pointed out that there was a difference in antiquity between *to kosmêtikon tês iatrikês meros* (the preservation of beauty) and *to kommôtikon* (the "unnatural embellishment" of looks), a distinction clearly found in Galen, for instance.[16] While the former was acceptable, the latter was not, and "it is hardly coincidental" therefore that most of our works on cosmetics from antiquity concentrate on the former.[17] I examine both kinds of substances in this paper, but it is noteworthy that most of our information on makeup (*to kommôtikon*) comes from a hostile tradition. Peculiar or repellent substances said to have been used by women as makeup therefore may tell us more about ancient notions of the feminine than about cosmetic substance.

II. Substance

What follows is a summary of the information that male authors give us about cosmetic substance; subsequent sections will detail how these substances were utilized elsewhere.

A pale, smooth complexion was very much desired (probably as an indicator of social status: fair skin displayed membership in the leisure class), and skin was ideally white all over.[18] Such

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[15] Thus, the scant information we find concerning female adornment in the ancient sources may not be due to any male "fear" or inherent dislike of cosmetics. See Dixon (above, n.11) 31: "[M]ale literary neglect of female desire might be just a self-centered oversight, like the neglect of mother-daughter relations—it need not be based on a *fear* of female sexuality."

[16] On which, see most recently Gibson (above, n.13) 174–75, 186 (an excellent summary of the tradition, with references); and Grillet (above, n.13) 11–18. Gibson (above, n.13) 175. Gal. 12.434f. K.

[17] Gibson (above, n.13) 175. See also Grillet (above, n.13) 18–20; Forbes (above, n.1) 43ff; and Rosati (above, n.1) 46ff. As Gibson points out, this makes the recommendation of cosmetics designed to enhance looks in Ovid *Ars am.* 3 all the more significant, as it is the only passage surviving from antiquity "which may be construed as containing a recommendation of makeup" (Gibson [above, n.13] 175; Saiko [above, n. 1] 220–34). Ovid does state, however, that poems had been written on the subject (*Tr.* 2.487), and his *Medicamina* probably contained information on *to kommôtikon.*

[18] Pale skin: Prop. 2.22.5–6, 8, 2.29.30; Ov. *Am.* 1.7.51–52, 2.4.41, 2.5.37–40, 2.16.29, 3.2.42, 3.3.5–6, 3.7.7; *Ars am.* 3.309; Plin. *Pan.* 48.4; *CIL* 6.37965; Mart. 4.62; Lucr. 4.1160 (the opposite of the ideal); Hor. *Carm.* 2.4.3–4; see Apul. *Met.* 10.30. Pliny the Elder tells us that an ingredient in paint called "ring-white" (*anulare*) was used in painting to give brilliance to the pale complexions of female portrait sitters (*HN* 35.48). On *femineus pallor*, see Sharrock (above, n.1) 40, who notes that *eburneus* and *niveus* are "erotic-aesthetic" epithets for the female body in elegy; and Gibson (above, n.13) 176–77. If construction of a particular physical appearance stems from "visualizing the self based on external images," whether these images be living people or artistic representations (A. Hollander, *Seeing through Clothes* [New York 1978] 452–53), it seems at least possible that the popularity of pale skin for women could be due not only to status considerations, but also to aesthetic ones: the fact that statues with white marble or ivory "skin" were considered beautiful may have led women to approximate this skin tone as closely as they could. For women *specifically* described in terms of ivory or marble, see Prop. 2.1.9; Ovid *Am.* 3.7.7–8, *Met.* 10.248–249,

pronouncements are found in a variety of authors and time periods. The name Chione, for instance, used by Juvenal and especially Martial to designate an aloof mistress or girlfriend, is itself indicative of the current standards of beauty—the word means "snowy" or "cold" but also "white-skinned."[19] Various cosmetic substances were said to have whitened the skin (and also functioned, probably, as sun-blocking substances).[20] The most popular preparation was *cerussa* (sugar of lead),[21] a substance made by pouring vinegar over white lead shavings and letting the lead dissolve. The mixture was then dried, ground, and fashioned into cakes or tablets to be sold.[22] The substance did produce a perfect complexion, and Ovid recommends it to brighten a pasty face.[23] The use of *melinum* or white marl (clay from Melos mixed with calcium carbonate) also resulted in a pale complexion; Pliny described it as "excessively greasy."[24] Chalk dust (*creta*) was used in antiquity (among other applications) for cleansing garments, making seals, and as a polish; it could also be used on the face to whiten it and was safer than white lead, which the ancients knew was poisonous (see below).[25] Chalk was applied mixed with vinegar: Horace speaks of "damp cosmetic chalk."[26] Martial wryly warned those women who applied chalk dust or *cerussa* to keep out of the rain lest their makeup streak, and also to avoid the sun, because sweat would likewise ruin the mask.[27] Women reportedly tried other methods to lighten their skin. Ovid claims his recipes for face creams would make a woman's complexion "pale and brilliant."[28] *Crocodilea*, the

254–255, 275–276; Hor. *Carm.* 1.19.4–5; Petron. *Sat.* 126; *CIL* 6.37965.18 and 20; Mart. 6.13.3–4, 11.60.8; Lucil. In Non. 627L. For women as art objects, see below.

[19] Chione: Mart. 1.34.7, 1.92.6, 3.30.4, 3.34, 3.83, 3.87, 3.97, 11.60; Juv. 3.136. One scholar believes that Greek names for women probably suggested romance or sex (A. Dalby, *Empire of Pleasures: Luxury and Indulgence in the Roman World* [London 2000] 127); but on this, see J. Griffin, *Latin Poets and Roman Life* (London 1985) 1–8, 10–20, 28.

[20] Ov. *Ars am.* 2.209. Perhaps women also carried parasols while outdoors to preserve the complexion naturally: see Mart. 14.28 (*umbella* against sun or rain); Juv. 9.50 (*umbella*). See Croom (above, n.1) 107–8.

[21] On *cerussa*, see also Ar. *Eccl.* 878–879; Alexis fr. 103.17 K; Grillet (above, n.13) 33–36; Gibson (above, n.13) 176–77; T. L. Shear, "Psimythion," in J. Allen, ed., *Classical Studies Presented to Edward Capps on his Seventieth Birthday* (Princeton 1936) 314–17; and Saiko (above, n.1) 135.

[22] Plin. *HN* 34.175–176; 28.139, 183, 34; 35.37.

[23] Perfect complexion: Mart. 7.25; Ov. *Med.* 73; Pl. *Most.* 258.

[24] *HN* 35.37: *nimium pinguitudinem*; see Pl. *Most.* 264.

[25] Plaut. *Poen.* 969 (as a whitener for clothes); Cic. *Flac.* 37 (as a seal); Plin. *HN* 33.131 (for polishing silver). Facial whitener: Mart. 2.42, 8.33.17; Plaut. *Truc.* 294; Petron. 23.4; Saiko (above, n.1) 135; Gibson (above, n.13) 176.

[26] *Epod.* 12.10: *umida creta*; see also Mart. 6.93.9; Ov. *Ars am.* 3.199.

[27] Mart. 2.41.11–12. St. Jerome also reminded women not to shed tears while made-up (Jer. *Ep.* 54.7 and 38.3; here a woman's face is whitened with gypsum). See also Gibson (above, n.13) 184: "[I]t is common in anti-cosmetic contexts to ridicule women by picturing the moment when their cosmetics are made to run through tears or sweat." Leary (above, n.1) 154 comments, "[O]f course, such dangers might be avoided by staying at home, but one would not then encounter any men. Life without water-proof cosmetics was extremely hard."

[28] *Medic.* 52: *candida, nitere*; see Rosati (above, n.1) 72–73; and Mart. 7.13.

dung of a crocodile, is recommended as a facial whitener at Ovid *Ars* 3.269–270 (on this substance, see below). Some upper-class women reportedly bathed in asses' milk because it was thought to contribute something to the whiteness of female skin.[29] Martial tells of dusky Lycoris who came to the springs at Tibur, hoping to whiten her skin at the waters which legendarily had the power to bleach substances.[30] So most authors concur in identifying white skin as a component of the attractive woman (and also manage to belittle the woman who uses such substances on her skin in pursuit of beauty).

According to widespread literary sources, rouge was the next most visible element of a woman's face, often mentioned in "contexts of condemnation." Cinnabar (red mercuric sulphide) and *minium* (red lead), both poisonous substances, are sometimes cited by modern authors as ingredients used by the Romans for female cosmetics.[31] But to my knowledge neither of these substances is ever described *specifically* as women's rouge, although Ovid mentions the use of "poisonous compounds" to impart a blush.[32] More benign materials occur instead: some women colored with *rubrica* (red ochre); *fucus*, a red dye derived from the orchella weed; or red chalk.[33] Dio Chrysostom refers to alkanet as a red dye for the cheeks.[34] Ovid states that rose and poppy petals were used to impart a blush to the face.[35] Ovid and Plautus mention powder dyed with Tyrian purple;[36] Ovid also

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[29] Plin. (*HN* 11.238) mentions this fact in relation to all women, more specifically Poppaea; Juvenal (*Sat.* 6.469–470) in relation to all women; Dio Cassius (62.28) in reference to Poppaea only. Pliny, at *HN* 34.183, alleges that some women wash their face seven times a day in asses' milk.

[30] 1.72.5–6: *sic, quae nigrior est cadente moro/cerussata sibi placet Lycoris* ("thus Lycoris, darker than a falling mulberry, pleases herself when plastered with white lead"). See also 7.13.

[31] Condemnation: Gibson (above, n.13) 177. Modern authors: see Forbes (above, n.1) 42; J. Healy, *Pliny the Elder on Science and Technology* (Oxford 1999) 215–19; and Leary (above, n.1) 153. *Minium* was of course used to color the face of the *triumphator*. On cinnabar and minium, see Grillet (above, n.13) 157–60; and Pliny (*HN* 29.25; 33.118, 119, and 124: *quod cum venenum esse conveniat.*

[32] Ov. *Rem. an.* 351: . . . *compositis cum collinet ora venenis* ("when she is painting her cheeks with poisonous concoctions"), although admittedly this could refer to *cerussa*. In eighteenth-century England, women were apparently still using tinted lead powders for rouge (F. Gunn, *The Artificial Face: A History of Cosmetics* [New York 1973] 115).

[33] *Rubrica*: Plaut. *Truc.* 294; on this substance see P. Hannah, "The Cosmetic Use of Red Ochre (*Miltos*)," in L. Cleland and K. Stears (eds.) *Color in the Ancient Mediterranean World* (Oxford 2004); *fucus*: Plaut. *Mostell.* 275; Tib. 1.8.11.

[34] Dio Chrys. *Eub.* 117.

[35] *Medic.* 96 and 99; on which, see Rosati (above, n. 1) 80–81.

[36] Ov. *Ars am.* 3.269–270: *Pallida purpureis tingat + sua corpora + virgis* ("let a pale woman tint her face with sticks of purple"). On "purple" on the cheeks, see M. Hendry, "Rouge and Crocodile Dung: Notes on Ovid, *Ars* 3.199–200 and 269–70," *CQ* 45.2 (1995) 583–88. Hendry (584–86) tentatively suggests that, with the emendation of *corpora* to *tempora*, we should read the reference as referring to the solid sticks in which ancient rouge may have been sold; or as the small wooden stick or brush used to apply rouge from a jar. However, "either of these ideas would need a parallel to be totally convincing" (585). *Purpura* can mean scarlet or pink, but Gibson notes that the woman described as *pallida* would need stronger color [above, n.13] 205; pale

refers to *faex*, the lees of wine.[37] More exotic substances were used for rouge as well: several authors mention *crocodilea*,[38] the contents of crocodile intestines.

Galen, for example, commented: "[B]ut dainty women highly prize the dung of land crocodiles (those that are small and crawl on the ground); for such women it is not enough that there are countless other cosmetics by which their faces are made smooth and shiny—no, they also include the dung of crocodiles." Intriguingly, Pliny writes that this crocodile is a land-dweller who lives on sweet-smelling flowers; hence, the contents of its intestines are pleasantly fragrant. He recommends the substance be applied mixed with starch or chalk, or the droppings of starlings.[39] Horace speaks of "a complexion tinted with the dung of a crocodile." This is an instance in which information about women's lives may well be colored by dominant masculine attitudes: such is the desire to achieve beauty that (frivolous? desperate?) women will even apply excrement to their faces.[40] One scholar has noted, however, that the term *crocodilea* "may be an Egyptian code-word for 'Ethiopian soil' (presumably a particular earth found beyond Upper Egypt; Lemnian and Samian earths were highly prized for skin preparations); thus it appears in the substitution list in Betz."[41]

These varied substances may have produced different tints: Ovid warns the young man who surprises his mistress at her toilette that he will see *pyxides* and "a thousand colors," an allusion to cosmetics which possibly includes colors of rouge.[42] It is also intriguing to note a disjunction between art and literature on this subject: extant portraits of Roman women in fresco and mosaic do not in fact present us with images of women in artificial red and white "masks," but with, instead, a natural-looking skin tone. Perhaps the "plastered" face is a hyperbolic fantasy of the authors in the anticosmetic tradition, who exaggerate in order to comment on the nature of the feminine: deceptive and frivolous.

women were encouraged to use rouge at *Ars am.* 3.200). For *tempora* as referring to "forehead," see Prop. 2.18.31–32. Plautus also mentions powder dyed with purple (*purpurissimum*) at *Mostell.* 261 and *Truc.* 290.

[37] *Ars am.* 3.211–212. Gibson (above, n.13) 184 defines *faex* as "a facial preparation," but at Hor. *Ars P.* 277, the substance is used by actors as face-paint. Given the color of the substance, it was probably used as a type of rouge.

[38] On which, see Hendry (above, n.36); and Gibson (above, n.13) 206; Saiko (above, n. 1) 248–49; and J. Vons, *L'image de la femme dans l'œuvre de Pline l'Ancien* (Col. Latomus 256, 2000).

[39] Gal. 12.47–48k; Plin. *HN* 28.28, 28.184, 108–109.

[40] Hor. *Epod.* 12.10–11: *colorque/stercore fucatus crocodili*; Pliny also recommended bull's feces for the same purpose (*Plin. HN* 28.184).

[41] H. D. Betz, *The Greek Magical Papyri in Translation Including the Demotic Spells* (Chicago 1996) 167–69. I am indebted to Prof. T. Rihill (Univ. of Wales, Swansea) for this quotation.

[42] Ov. *Rem. am.* 353: *pyxidas invenies et rerum mille colores*. In eighteenth-century France, rouge was an index of social status: upper-class women used the brightest rouge and wore it in great quantity as a component of the artificial face, itself an index of nobility. Different shades went in and out of vogue. See E. de Goncourt and J. de Goncourt, *The Woman of the Eighteenth Century*, trs., J. Le Clercq and R. Roeder (New York 1928 [1862]) 256–58.

Lining the lids and coloring the lashes may also have been practiced, an activity which, as Gibson points out, was routinely condemned in the anticosmetic tradition.[43] Pliny the Elder states in regard to eyelashes that "daily are they dyed with cosmetic by women: such is their claiming of beauty that they color even their eyes."[44] He states that eyelashes may fall out due to sexual overindulgence; but he does not specifically attribute this behavior to women in makeup. Different substances were used to outline and enhance eyes. Kohl (*stibium*) was composed of soot (*fuligo*),[45] lamp black mixed with grease, antimony (a crystalline metallic element), or ashes mixed with oil,[46] applied with a thin stick or needle (see below). Ovid also mentions saffron as an eyeliner.[47] Eyeliner had the property of magnifying the eye, and for that reason was also called *platyophthalmon.*[48] *Calliblepharum* was another cosmetic for women's eyelashes or eyelids (similar to *stibium*), with ash of rose-kernels or dates as the principal ingredient.[49] It is unclear in these passages whether lids or lashes are meant as the location of the cosmetic (possibly Pliny and others did not know themselves). He also remarks that oysters with a purple line encircling (*ambiente*) the beard are said to be *calliblephara* [=*calliblepharata*], beautifully eyelidded (*HN* 32.61). This passage suggests that a line was drawn around the eye, rather than outlining the eyebrow or coloring the eyelid itself. Pliny's section on the making of antimony (33.103) also includes the information that often the substance was made into tablets to be sold.

Kohl was applied to eyelids and brows in powdered form. A thin kohl stick was used, made of wood, glass, bone, or ivory: the stick was dipped in water or scented oil first and then in the powder. Today a rod is placed horizontally on the eyelid and drawn out sideways while the eye is closed; ancient kohl sticks have a rounded point at one end, indicating a similar method was used in antiquity. The shape of the kohl tube (long and thin) also seems to be connected with the method of application.[50] Remains of kohl are sometimes found

[43] Gibson (above, n.13) 178; and Glazebrook, in this issue.

[44] Plin. *HN* 11.154: *mulieribus fuco etiam infectae cotidiano: tanta est decoris adfectatio ut tinguantur oculi quoque*; see Vons (above, n. 38) 334–36

[45] See Grillet (above, n.13) 48–51; and E. Courtney, *A Commentary on the* Satires *of Juvenal* (London 1980) on Juv. 2.94–95.

[46] Soot and lamp black: Plin. *HN* 28.163; Juv. 2.93; black "powder:" Tert. *Cult.* 2.5.2 (*nigrem pulverem*)· Antimony: Dayagi-Mendels (above, n.1) 42. Ashes (of goats' meat) mixed with oil: Ov. *Ars am.* 3.203; Plin. *HN* 28.166. Pliny also reports that "they say eyebrows are made black by crushed flies" (*supercilia denigrari muscis tritis tradunt* 30.134). See also Sen. *Controv.* 5.6 and Saiko (above, n.1) 135–36. Needle: Juv. 2.94.

[47] *Ars* 3.204; see Gibson (above, n.13) 178, with references; and Grillet (above, n.13) 48.

[48] Plin. *HN* 33.102: *ideo etiam plerique platyophthalmon id appellavere quoniam in calliblepharis mulierum dilatet oculos* ("since that is why even a majority of people have called it 'wide-eye,' because in eyeliners it magnifies women's eyes").

[49] Plin. *HN* 21.123, 35.194 (an asphaltic deposit). Varro, *Sat. Men.* 370, also speaks of *calliblepharo naturali palpebrae tinctae* ("eyelashes tinted with natural *calliblepharum*).

[50] See Dayagi-Mendels (above, n.1) 40–42; E. M. Stern, *Ancient Glass at the Fondation Custodia* (Gröningen 1977) 117; Kleiner and Matheson (above, n.1) 163,

in cylindrical cosmetics tubes which are double or even quadruple-barreled, perhaps for different colors (green and black were known in antiquity). The simplest types probably had a one-piece handle over the top to which the kohl stick would have been attached by a chain.[51]

Three Latin authors describe a single eyebrow as beautiful, another cosmetic feature which is not borne out by artistic evidence.[52] At *Ars amatoria* 3.201, Ovid writes "with art you fill up the bare common borders of the eyebrow."[53] Petronius describes an attractive woman as having eyebrows that "ran to the outline of her cheekbones and almost met again near her eyes." Claudian praises the beauty of Honorius' consort Maria with the words: "[W]ith how fine a space between do your delicate eyebrows meet on your forehead." Juvenal described effeminate men using *stibium* or *fuligo* for lengthening eyebrows; false eyebrows are mentioned by Martial and Petronius.[54]

Tertullian exhorted Christian women to "color their lips with silence," implying that ordinarily women's mouths were painted with an artificial substance.[55] But there is no evidence in the classical authors that Roman women colored their lips;[56] if this was the case, surely tinted lips would have been singled out for mention by the authors, especially the love poets.

I would argue that a beautiful complexion was central to the Roman definition of the feminine, or at least the sexually attractive female; allusions to this feature are found in Roman authors across genre and time period. Most Roman beauty recipes pertain to the skin,[57] and rightly so, since it must have been ravaged by dirt, disease, and the effects of lead and mercury in makeup.[58] In his

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no. 116 (double kohl tube, 5th or 6th century C.E., Yale University Art Gallery, Anna Rosalie Mansfield Collection no. 1930.389).

[51] During the fifth century, the handles become more and more elaborate, "and finally ended in the sixth century with an elaborate system of interlacing handles in a truly Baroque style" (Stern [above, n.50] 117). The majority of such cosmetics containers are found in graves.

[52] Gibson (above, n.13) 177 lists further references: Dioscor, *Anth. Pal.* 5.54.3; [Theoc.] 8.72ff; Suet. *Aug.* 79.2.

[53] Gibson, tr., (above, n.13) 177.

[54] Petron. *Sat.* 126: *supercilia usque ad malarum scripturam currentia et rursus confinio luminum paene permixta*; Claud. *Epith.* 268–269: *quam iuncti leviter sese discrimine confert/umbra supercilii*. Effeminate men: Juv. 2.93–94. False eyebrows: Mart. 9.37 (on a woman); Petron. *Sat.* 110 (on a boy). Richlin (above, n.1) 191 cleverly terms these "spare body parts."

[55] Tert. *Cult.* 2.13.7; see also Jer. *Ep.* 38.3.

[56] Contra Balsdon (above, n. 1) 262, and Leary (above, n. 1) 154. Leary does state that there are no references to the practice in extant literature. Women are however sometimes described as having mouths which are "purple/bright" (*purpureo ore*; Cat. 45.12) or "reddish" (*roseo ore*; Verg. Aen. 2.593, 9.5).

[57] Richlin (above, n.1) 198.

[58] On sanitation in Rome, see A. Scobie, "Slums, Sanitation, and Mortality in the Roman World," in *Klio* 68 (1986) 399–433; and W. Scheidel, "Germs for Rome," in C. Edwards and G. Woolf, eds., *Rome the Cosmopolis* (Cambridge 2003) 158–76. On the effects of poisons in cosmetics, see below.

catalogue of remedies for skin complaints,[59] Pliny mentions pimples (*vari*), blemishes (*molestiae*), freckles (*lentigines*), "spots" (*maculae*), peeling of the skin (*scobis)*, facial itching (*vitiligo*), livid bruises (*suggillata*), eruptive skin diseases (*lichen*), leprous sores (*leprae*), scars (*cicatrices*), pituitous eruptions (*impetus pituitae*), spreading sores (*vitia quae serpunt*), and nameless facial "troubles" (*vitia*).[60] There were several substances, listed again mainly by Pliny, which were reputed to bring a bright and clear complexion. *Crocodilea* mixed with cyprus oil was efficacious in this regard. Ground oyster shells smoothed the skin.[61] Pimples could be removed with a mixture of poultry fat and onion, and wrinkles were smoothed away with swan's fat or asses' milk, or axle-grease.[62] The ash of snails (among other substances) was reputed to cure freckles, itch, and leprous sores (*HN* 30.75). In addition, white lead reportedly had properties of smoothing the face and removing blemishes (Plin. *HN* 28.183), ironic inasmuch as the continued use of white lead in foundations probably led to the swift disappearance of a youthful complexion (see below). Other recipes employed a variety of ingredients, such as cucumber (*HN* 20.9), rocket (*HN* 20.125), anise (*HN* 20.185), and mushrooms (*HN* 22.98). *Helenium*, a plant substance, made the face and skin perfect and thereby enhanced sexual attractiveness.[63]

Celsus reports that honey cleansed the skin, but notes that it was more efficacious in this regard mixed with galls, bitter vetch, lentil, horehound, iris, rue, soda, or verdigris. He gives recipes for

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[59] Negotiating the large amount of information contained in the elder Pliny concerning skin remedies was made considerably easier by the work of Richlin (above, n.1) and Vons (above, n.38) 253–57, who provide exhaustive references and lucid explanation.

[60] See Plin. *HN* 30.28–30; *HN* 28.109 (*maculae*). *Cicatrices* are mentioned at 28.187; pituitous eruptions and spreading sores at 28.183.

[61] *Crocodilea*: Plin. *HN* 28.108–109, 184 and above. Oyster shells: Plin. *HN* 32.65: *cutemque mulierum* extendit. Grinding oyster shells in this way would have produced lime, which would burn the skin and possibly make it smoother.

[62] Pliny *Nat.* 30.30. Asses' milk: see above. Axle grease: 28.140. On this topic, see Vons (above, n.38) 258–67. Pliny also mentions in passing (30.30) that branding-marks, presumably on the face of an ex-slave, could be removed by a mixture of pig's dung in vinegar.

[63] *Nat.* 21.159: *Helenium ab Helena, ut diximus, natum favere creditur formae, cutem mulierum in facie reliquoque corpore nutrire incorruptam* ("Helenium, which had its origin, as I have said, in the tears of Helen, is believed to preserve physical charm, and to keep unimpaired the fresh complexion of our women, whether of the face or the rest of the body"); see also 21.59. Skin creams were also made from the fat of a sow who had not littered (Plin. *Nat.* 28.139), or the jelly of a bull's calf-bone (which also contributed to whiteness of skin, 28.184). Even the foam from beer was thought useful as a means to preserve the skin (*Nat.* 22.164). Pliny also recommends the ash of the murex shell mixed with honey (applied to the skin every day for seven days and followed on the eighth day by a wash of egg-white; *Nat.* 32.85). Ashes of cuttlefish bones could remove freckles and other facial troubles (*Nat.* 32.85). Fish-glue (*ichthyocolla*) could remove wrinkles (*Nat.* 32.84; and see 22.65). It is worth noticing that outer blemishes could be a sign of inner *vitia*: Pliny the Elder asserts that women with freckles could not make ritual offerings in magic custom (*Nat.* 28.188; see also 30.16), presumably because freckles denoted a woman who herself was not pure (?). See Richlin 1995: 199–200.

disguising scars, removing pimples, and hiding spots and freckles, although he states that since they are only a rough discoloration of the skin, "freckles are ignored by most" (whether women or medical practitioners he does not say).[64] A cream used to make the skin soft, called *oesypum*, was made from the grease extracted from unwashed sheep's wool and was widely available; Ovid mentions some from Attica.[65] And we may note that these substances all function in the modern sense as remedies and cosmetics, having both curative and beautifying properties, although they would have been classed by many ancient writers under *to kosmêtikon*.

Ovid's *Medicamina* has complete recipes for four face packs with an incomplete recipe for a fifth.[66] He writes that the complexion of the woman who uses his recipes for beauty creams "will shine smoother than her own mirror" (*Medic.* 67–68). Ovid's skin treatments contain a variety of natural ingredients which were thought to improve the complexion: barley and vetch, for instance, which cleared the complexion and removed pimples;[67] gum arabic, which was reputed to eradicate wrinkles and improve the skin;[68] bean-meal (*lomentum*), used to remedy wrinkles;[69] and *aphronitrum* or "soda-scum," also used to remove wrinkles and freckles.[70] Iris, too, cured skin complaints and freckles.[71] Other ingredients in Ovid's face packs include frankincense[72] and myrrh,[73] used to cleanse and remove wrinkles and freckles; saltpetre (used for removing warts),[74] rose leaves and poppy (used as

[64] Honey: Celsus *Medic.* 5.16: *cutem purgat mel.* Freckles: *ephelis vero a plerisque ignoratur*, *Medic.* 6.5. See Richlin (above, n.1) 199–200 on Pliny's recipes for freckle removal and Saiko (above, n.1) 225–34.

[65] *Ars am.* 3.213–214; on which see Gibson (above, n.13) 184. See Plin. *HN* 29.35–38. L. Allason-Jones, *Women in Roman Britain* (London 1989) 130, calls *oesypum* "foundation" (i.e., a product designed to give smooth color to the face), which it clearly was not. Nowadays, purified, the cream is called lanolin.

[66] For a detailed treatment of the ingredients in and general efficacy of Ovid's recipes, see Green (above, n.1); and Richlin (above, n.1) 197. Gibson (above, n.13) 180 notes that three of the facepacks in the *Medic.* could be used to remove defects from the skin and the other two to improve the skin.

[67] Ov. *Medic.* 53–55; Plin. *HN* 20.20, 22.122, 151, 161, 24.63, 28.183, 30.75; Celsus 2.33.5, 5.16, 5.28.19d.

[68] Ovid *Medic.* 65; Plin. *HN* 24.106.

[69] At Mart. 3.42.1, it is used to conceal a blemish; and see T. J. Leary, *Martial Book XIV: The Apophoreta* (London 1996) 119–20 and Saiko (above, n.1) 130–32.

[70] Ov. *Med.* 73; Plin. *Nat.* 31.111–113. It is difficult to say what this substance actually is: soda, soda with salt, or potassium nitrate are a few of the scholarly conjectures: see Healy (above, n.31) 198–99; Green (above, n.1) 385; Leary (above, n.69) 116–17. For a detailed look at all five recipes, see Saiko (above, n.1) 203–15.

[71] Skin complaints: Plin. *HN* 21.143, 23.63, 26.143; Celsus 5.16; Green (above, n.1). Freckles: Plin. *HN* 28.188.

[72] Ovid *Med.* 83–85. Frankincense is mentioned in Celsus 5.5 as a cleanser and erodent.

[73] The elder Pliny states that myrrh is a remedy for many ills, including promoting menstruation, facilitating childbirth, aiding consumptives; sores on the head or face may be cured by a tisane of myrrh and water (*HN* 24.154). See 6.174, 12.69.

[74] Ovid *Med.* 85. See Green (above, n.1).

a cleanser),[75] and a mysterious substance called *alcyoneum*.[76] Some recipes for face creams were less salubrious, however, containing poisonous mercury sublimate or white lead.[77]

Propertius (2.29B.30) and Martial (9.37) state that makeup was removed at night. Juvenal mentions a nightly bread-poultice used by an adulterous wife, and an oily cream called *pinguia Poppaeana*.[78] This is a dangerous text: the name of the cream is of course meant to align the woman who uses it with the licentious empress, and perhaps should not be taken as indicating an actual cosmetic product.

But all skin creams and treatments had varying degrees of efficacy. To conceal the inevitable blemishes, scars, and ravaged areas of the face, we have a reference to a woman employing white lead foundation to give the complexion a smooth consistency (Mart. 7.25 and 1.72.4–5). More ingeniously, tiny patches called *alutae* or *splenia* made of thin soft leather (often treated with alum) were pasted directly onto the skin. These scraps became popular in and of themselves, and in time became fashion rather than camouflage: "a tiny *aluta* veils cheeks without a blemish," observed Ovid. Sometimes the patches were cut into different shapes: Martial speaks of crescent-shaped *splenia* sitting on the forehead.[79] Again, this practice strongly suggests that the ideal female complexion in Rome was one without scars or spots, which must have been very difficult to achieve in antiquity, given the poor sanitation and prevalence of disease.[80]

Several authors, across genre and time period, mention that a beautiful woman had sleek skin with no physical blemishes. Pliny gives a recipe to eliminate stretchmarks (*HN* 31.84); Martial reports that a paste of bean-flour was used by women to remove belly wrinkles (3.42.1, 14.60). A hairless body may have been the feminine ideal: Ovid states that women ought to shave their legs; Pliny also states that women should remove body hair.[81] The epitaph of Allia Potestas states, "she kept her limbs smooth and the hair was sought

[75] Rose leaves: Ovid *Med.* 93; Plin. *Nat.* 21.123–125. Poppy: Ovid *Med.* 99; Cels. 2.32; see Green (above, n.1) 390.

[76] *Medic.* 78; on the substance *alcyoneum* Green (above, n.1) 386–88. Saiko (above, n.1) 130–32.

[77] Ov. *Medic.* 73–74; Kleiner and Matheson (above, n.1) 160.

[78] Bread-poultice: 6.461–462; 2.107; Suet. *Otho* 12; *pinguia Poppaeana*: Juv. 6.462–463.

[79] Ov. *Ars am.* 3.202: *parvaque sinceras velat aluta genas* (see Gibson [above, n.13] 178). Saiko (above, n.1) 136. For large patches or plasters with medicinal purposes, Plin. *HN* 29.126, 30.104. Mart. 8.33.22: *talia lunata splenia fronte sedent*; at 10.22.1, the patches are used by a man to cover branding-marks; see 2.29.9. The trend has a parallel in eighteenth-century France, where the little patches (*mouches* or *mouches dans la lait*), made of red or black taffeta and cut into shapes, were pasted onto the skin to conceal smallpox scars. As in Roman antiquity, the patches were soon worn merely for the sake of fashion, and their placement could indicate the mood of the wearer (the French coquette would wear one near her lips, for example; de Goncourt and de Goncourt (above, n.42) 258.

[80] See above, n.58.

[81] Ov. *Ars am.* 3.193–194, see also 437; Plin. *HN* 26.164: depilatories are a woman's cosmetic, *psilotrum nos quidem in muliebribus medicamentis tractamus* ("depilatories I indeed regard myself as a woman's cosmetic"). See Vons (above, n.38) 277–81.

out everywhere."[82] Lucian writes that apart from her head, "the rest of a woman's body has not a hair growing on it and shines more brilliantly than amber . . . or Sidonian crystal."[83] Although a Greek source, it corroborates what certain Latin authors say about female hairlessness.[84] Unwanted hair from the legs and genitalia was eliminated in a number of different ways: it was plucked, scraped away by pumice stone, singed off, or stripped by means of pitch or resin.[85] Martial speaks of the practice not as a prerogative of status (he says prostitutes do it), but of age. Women supposedly eliminated body hair in preparation for (or in hopes of) sexual activity, and depilation was therefore deemed appropriate only for sexually active young women. He therefore ridiculed depilation in women over a certain age.[86]

III. Negative Views/Repellence

As two scholars have observed,[87] many authors, who no doubt reflected the views of some men and women in Roman society, found the use of adornment by a woman cause for condemnation. Maria Wyke notes that "it is perhaps Ovid . . . who most provocatively and persistently removes the *cultus* and *ornatus* of the female body from the realm of moral disapproval."[88] There is no doubt that personal ornament was viewed by some as an objectionable activity, dismissed as fatuous, expensive, time-consuming, wasteful, and un-Roman;[89] and that the woman who spent time and energy on clothing and makeup was labeled dishonest, sexually licentious, and a locus of social disorder. Previous scholars have done an admirable job of summarizing the moralizing discourse surrounding adorned women, and I will not repeat their findings here.[90]

Some cosmetics were condemned as disgusting and described with repugnance by authors in different genres.[91] Selected beauty preparations

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[82] *CIL* 6.37965.23: *levia membra tulit pilus illi quaesitus ubique*, N. Horsfall, tr., "CIL VI 37965–CLE 1988 (Epitaph of Allia Potestas): a Commentary," in *ZPE* 61 [1985] 256.

[83] Luc. *Am.* 26. Of course, some deemed pubic hair attractive: *CIL* 4.1830.

[84] One scholar has postulated that female hairlessness in the nineteenth century connoted childishness, virginity, and purity (Hollander [above, n.18] 146), and it is possible that these resonances were also in place in Roman antiquity.

[85] Plucking: Mart. 10.90. See also Sen. *Ep.* 56.2 (hair-pluckers hawking their services in the bath-houses) and *CIL* 6.9141. Pumice: Ov. *Ars am.* 1.506, *nec tua mordaci pumice crura teras* ("[take no pleasure] in scraping your legs with the biting pumice-stone"); of men. Resin: Mart. 12.32.21–22. Domitian reportedly depilated his concubines himself: Suet. *Dom.* 22. *Dropax*, a kind of depilatory ointment, is spoken of in the sources as employed by men (Mart. 3.74 and 10.65.8); and Pliny mentions other depilatory creams (also for men): *HN* 30.132–134; see also 29.26.

[86] Mart. 12.32.21–22, 10.90. Contra D'Ambra (above, n.5) 225, who holds that only elite women depilated. On hairlessness and Greek women, see Ar. *Eccl.* 60, 67.

[87] Richlin (above, n.1) *passim*; and Wyke (above, n.1) 146–48.

[88] Wyke (above, n.1) 145 and Gibson (above, n.13) 175.

[89] For the economic aspects of female adornment see especially Wyke (above, n.1) 140–41.

[90] Richlin (above, n.1); and Wyke (above, n.1).

[91] See Richlin (above, n.1) 186, 189, 190.

were visually displeasing, for instance: Juvenal states that a wife will "swell her face with bread [packs]," thereby making the woman and her face foul and ridiculous.[92] Martial begs a woman not to cover her beautiful face with black cream.[93] As well, some cosmetics had a strong (although not necessarily a bad) smell: depilatories, poultices to remove wrinkles, and chalk moistened with vinegar (Mart. 6.93). Juvenal thought that the oily skin cream called *pinguia Poppaeana* had a repellent smell (6.462). *Oesypum* also had a strong odor (Ovid said it turned his stomach, likening it to the Harpies' excrement on Phineus' table) and was excessively greasy.[94]

In the anticosmetic tradition, men were allegedly repelled by the sight of women adorning. Lucretius, for instance, observed that women were well aware that the preparations they made and the substances they used in order to show a beautiful face to the world were in fact repulsive. *Ars est celare artem* governed the proper use of cosmetics, and women ought to be "at greater pains to hide all that is behind the scenes of life."[95] Even Ovid counseled women not to beautify themselves before a lover, as such activities will detract from an agreeable body image: "[T]hese things will give beauty, but they are unseemly to look upon: many things, ugly in the doing, please having been done."[96] He also advises keeping cosmetic substances hidden from men (*Ars am.* 3.209–218). Gibson has noted that "what unites the present passage with Lucretius is a common assumption that women in their raw state are unpalatable to men";[97] otherwise, Ovid "offers compensation to women while the Epicurean does not" (*Ars am.* 3.209–218).

IV. *Medicamentum/Medicamen*: Remedy and Poison

Medicamentum/medicamen was the most common word for a paint, wash or cosmetic. Ovid's treatise *Medicamina Faciei*, for example, gives recipes for face packs.[98] Seneca (*Dial.* 7.7.3) and Festus (500L)

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[92] Juv. *Sat.* 6.461–62: . . . *foeda aspectu ridendaque multo/pane tumet facies*.

[93] Mart. 3.3.1: *nigro medicamine*.

[94] See above, n.65 for references. A *pyxis* was used to hold medicine (Sen. *Ep.* 95.18); poisons (Juv. 13.25); or cosmetics (Ov. *Ars am.* 3.210; Apul. *Met.* 6.16). Gibson (above, n.13) 183 notes that in general the *pyxis* is a "repository for revolting substances." See M. Skinner, "The Contents of Caelius' Pyxis," *CW* 75 (1982) 243–45.

[95] *DRN* 4.1185–1186: *quos magis ipsae/omnia summo opere hos vitae poscaenia celant* . . .; some men may imagine nonetheless what goes on (1188–1189). On this passage see R. Brown, *Lucretius on Love and Sex* (Brill 1987) 303–7. Contrast Ov. *Am.* 1.14.17–18 and *Ars am.* 2.215.

[96] Ov. *Ars am.* 3.217–218: *ista dabunt formam, sed erunt deformia visu:/Multaque, dum fiunt, turpia, facta placent*; and generally, 219–234. There is a theme in Latin literature, noted most recently by Gibson (above, n.13) 182, of surprise intrusions into the private chambers of one's mistress, finding her unadorned and therefore repulsive: see Lucr. 4.1174–1191; and even Ov. *Rem.* 347–356. A character in Lucian (*am.* 39) states that it is disgusting to see a woman at her toilette, but it is also disgusting to see her as she rises from sleep, her adornment not yet in place.

[97] Gibson (above, n.13) 182; see Plaut. *Poen.* 240–245.

[98] See also *Rem. am.* 354–356. Ovid pioneered the use of the word *medicamen* in its meanings as abortifacient (*Epp.* 11.39), magic charm (*Epp.* 12.97), and cosmetic (*Medic.* 36); see Gibson (above, n.13) 179.

use *medicamentum* as a synonym for cosmetics. *Medicamentum* can also denote an artificial means of improving a thing, as when (for instance) oakwood ashes were used to flavor wine.[99] The third and fourth (and perhaps the most intriguing) meanings of *medicamentum/ medicamen* are a remedy or, conversely, a poison: Cicero uses both words as "curative;"[100] Valerius Flaccus utilizes *medicamen* to mean "toxin" (8.17). Juvenal uses *medicamen* for "drug," in reference to the potion given to a pregnant woman by an abortionist (6.595), and elsewhere as a remedy against poison (14.254 [see 6.661]). Seneca uses *medicamentum* to mean "poison" (*Controv.* 7.3.4); Pliny to mean "enchantment" (*HN* 20.101). Tacitus uses *medicamen* to describe the healing remedies given to Zenobia (*Ann.* 12.51), but also for the poison used on the emperor Claudius (*Ann.* 12.67). In addition, he utilizes the term for "medication" (the patches covering the lesions on Tiberius' face; *Ann.* 4.57)[101] and for "toxin" (the poison used on Burrus).[102]

Tacitus' uses of the word illustrate well the conflation of remedy and poison in Roman antiquity, but the extension of the semantic field to include "cosmetic" also makes sense in the Roman context. Amy Richlin is surely correct to argue that the properties of poison, medicine, cosmetics, and even magic were conflated in antiquity ("all crafts or skills aiming at a certain kind of control over the body and its surroundings"),[103] but there is also a material basis for that association. The fact that Juvenal calls a woman's made-up face "a wound" (*ulcus*; 6.471–473) is appropriate not because women were derided or injured by a beauty system,[104] but because many of the actual substances used for cosmetic purposes were employed themselves as

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[99] *Medicamen*: Plin. *HN* 14.126. See also Col. *Rust.* 7.8.2 (of additions to cheese); and 12.20.1 (additions to wine).

[100] Cic. *Pis.* 13: *vinolentis medicaminibus* ("vinous remedies"); *Att.* 9.5.2: cures prepared for the wounds dealt to the Republic.

[101] Martin and Woodman note that here "*medicamina* are either salves or cosmetics . . ., the latter perhaps more appropriate to the inveterate dissembler [Tiberius]" (R. H. Martin and A. J. Woodman, eds., *Tacitus* Annals *Book IV* [Cambridge 1989] 225).

[102] Burrus died "by Nero's instructions, his palate . . . smeared with a poisonous drug [*medicamen*], ostensibly as a remedial measure" (*plures iussu Neronis, quasi remedium adhiberetur, inlitum palatum eius noxio medicamine adseverabant*, *Ann.* 14.51).

[103] Richlin (above, n.1) 186. The *OLD* defines *medicamen* as "a substance administered or applied to produce specific effects upon the body." The *TLL* defines *medicamen* as: *usu strictiore, de rebus naturalibus vel compositionibus quae ad sanandos morbos*; s.v. *medicamen* col. 529: ("in more rigorous use, concerning natural substances or mixtures, for the curing of diseases"). Under *medicamentum* the *TLL* repeats the preceding and adds *aut extrinsecus . . . aut intrinsecus . . . adhibentur* (col. 532: "either externally . . . or internally . . . applied"). S. F. M. Grieco, "The Body, Appearance, and Sexuality," in *A History of Women in the West* vol. 3, N. Z. Davis and A. Farge, eds., (Cambridge, Mass., 1993) 61, reports that in seventeenth-century England, "those who made cosmetics were often suspected of dabbling in the magic arts, for many recipes contained incantations to be recited during preparation and ingredients such as earthworms, nettles, and blood."

[104] Contra Richlin (above, n.1) 200; and Wyke (above, n.1) 137. For a similar idea, see Lucian *Am.* 39.

remedies (and as poisons), a discussion taken up below.[105] Tellingly, at *Digest* 48.8.3.3, dealers in cosmetics (*pigmentarii*) may be prosecuted if they recklessly hand over poison.[106]

It is important to note at this point that not every cosmetic substance was felt to be repellent; some of them were even sweet-smelling (as in Ovid's skin creams).[107] Nor was there any substance in Roman antiquity that functioned *purely* as a cosmetic and *only* as a cosmetic. In America, for example, until the late nineteenth-century, most cosmetics were manufactured at home using components like chalk, beetroot, and burnt cloves; "an oral tradition concerning hair and skin care probably comprised an aspect of women's culture."[108] All materials applied to the face to improve one's appearance in Roman antiquity, even the "disgusting" ones, were likewise comprised of natural ingredients: soot, ash, powdered lead, grease from animals' wool. (This brings up the likelihood that it was the substances' application *as* cosmetics that determined repugnance, at least in the anticosmetic tradition). Often these substances had, sometimes primarily, a medicinal or other practical function in addition to their cosmetic use.

Many cosmetic ingredients were used largely as noncosmetic remedies, in keeping with the multiple meanings of *medicamen/ medicamentum* as cosmetic, poison, and remedy. The following information is gleaned largely from Pliny and the medical writers. *Oesypum*, for instance, was not used exclusively as a cosmetic; it could be employed as a remedy for a fissured anus, eye inflammations, sores in the mouth, and gout.[109] Martial implies that white lead was a remedy for wounds: he reports that he daubed his lips with the stuff, pretending to have sores, to avoid kissing an unattractive woman.[110] *Melinum*, another coloring for the face, was also used as a medicant in various forms: as astringent, to arrest hemorrhage, or remove granulations of the eye.[111] Antimony or *stibium* (a cosmetic ingredient) was also used as a medicine for ulcerations or wateriness of the eye, and as a treatment for wounds and burns.[112] Medical

[105] Of *medicamen* see Gibson (above, n.13) 179, who states "the noun need not convey the idea of 'remedy.'"

[106] "It is laid down by another *senatus consultum* that dealers in cosmetics are liable to the penalty of this law if they recklessly hand over to anyone hemlock, salamander, monkshood, pinegrubs, or a venomous beetle, mandragora, or, except for the purposes of purification, Spanish fly" (*alio senatus consulto effectum est, ut pigmentarii, si cui temere cicutam salamandram aconitum pituocampas aut bubrostim mandragoram et id, quod lustramenti causa dederit cantharidas, poena teneantur huius legis).* See also *Dig.* 10.2.4.1 (*mala medicamenta et venena).*

[107] Contra Richlin (above, n.1) 197.

[108] Peiss (above, n.3) 144–45; see also K. Peiss, *Hope in a Jar: The Making of America's Beauty Culture* (New York 1998).

[109] See Celsus *Medic.* 6.18.7a–b (along with white lead); Plin. *HN* 12.74 (this is *oesypum* made from goats, with no instance of use given); *HN* 29.37. Mixed with Corsican honey, Pliny claimed it could remove spots on the face (*HN* 30.28).

[110] Mart. 10.22; see also Celsus 6.6.7, n.111.

[111] Plin. *HN* 35.188, 35.194.

[112] See Celsus 6.6.6, 8; Plin. *HN* 29.118, 29.130, 33.102.

eye-salves could also be made from saffron (Plin. *HN* 20.187) and *crocodilea* (*HN* 28.108–109). Bean-meal or *lomentum* was used for boils and *vitiligo*.[113] *Aphronitrum* was used to clear up ringworm, impetigo, and scabies (and see below).[114] The ash of ground oyster shells could be combined with honey to produce a remedy for troubles of the uvula, tonsils, parotid swellings, and abscesses of the breasts (Plin. *HN* 32.65). Certain materials used as rouge were also employed as remedies: red ochre was utilized, among other things, as an enema, to check menstruation, or in plasters and poultices (Plin. *HN* 35.32).

Ovid's face-packs also contain a wide variety of ingredients used for other noncosmetic remedies. *Lomentum* was used to wash away stains, as a remedy for scrofula, or, with axle-grease and cypress leaves, to cure hernia.[115] At Martial 6.93, bean-meal paste is used by a woman to hide offensive body odor; and named elsewhere as a cure for an abscess and to disguise bruises.[116] Myrrh was a cleanser and erodent, a cure for creeping sores and scurf, and it was used to heal wounds.[117] Dried rose petals were sprinkled on chafed thighs, rose juice used as a remedy for sores in the mouth and for uterine and rectal troubles, among other complaints, and the flower induced sleep. Rose seeds were also used as a remedy for toothache and to clear the head, and the petals were useful for stomach complaints. The dried petals could also be used as an antiperspirant.[118] Poppy was used as a fomentation, and as a remedy for headache and gout.[119]

This close association between cosmetic and remedy is also evident in an archaeological context: distinguishing material remains pertaining to cosmetics[120] from those related to the medicinal is difficult. Small glass jars (often with painted lids which have not survived) could have held any one of a number of substances, including thick unguent, face powder, or other cosmetics or medicine in dry or liquid form.[121]

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[113] Plin. *HN* 22.140, 24.63; Diosc. 2.127; Celsus 5.28.19D.

[114] Plin. *HN* 24.63; see Celsus 5.28.18, 17C; *HN* 115–22.

[115] Stains: Cic. *Fam.* 8.14.4. Scrofula: Plin. *HN* 20.127. Hernia: *HN* 24.15.

[116] Body odor: see also Plin. *HN* 12.51–65. Abscess: Plin. *HN* 13.126, 30.75, 32.106. Bruises: Plin. *HN* 30.116.

[117] Cleanser: Celsus 5.5–6. Sores and scurf: Plin. *HN* 12.66–70, 24.86; see also 28.214. Wounds: *HN* 30.116.

[118] Thighs, rose juice: Plin. *HN* 21.123. Sleep: Plin. *HN* 21.123. Seeds: Plin. *HN* 21.124. Stomach complaints: Plin. *HN* 21.125. Antiperspirant: Plin. *HN* 21.125.

[119] Fomentation: Plin. *HN* 20.200–202, 207. Headache and gout: Plin. *HN* 20.201, 207.

[120] Archaeological remains of cosmetics (as opposed to cosmetic containers) are few: see Shear (above, n.21). On perfumed oil, see D. Barag, "Two Roman Glass Bottles with Remnants of Oil," in *IEJ* 22 (1972) 24–26; and A. Basch, "Analyses of Oil From Two Roman Glass Bottles," *IEJ* 22 (1972) 27–32. A container holding Roman face-cream was excavated from a Roman temple on the banks of the Thames in London, 2003: chemist Richard Evershed of the University of Bristol and his colleagues determined the cream contained refined animal fat, starch, and tin oxide (see http://www.cbc.ca/story/science/national/2004/11/03/Roman_cosmetic041103.html). See also R. Jackson, "The Function and Manufacture of Romano-British Cosmetic Grinders: Two Important New Finds From London, *Antiquities Journal* 73 (1992) 165–69; and "Cosmetic Sets from Late Iron Age and Roman Britian," *Brittania* 16 (1985) 165–92.

[121] Two names for these small receptacles in antiquity seem to have been *ampulla* or *ampoulla* (perhaps an irregular diminutive of *amphora*) and *olla*, both meaning

Cosmetics were extricated with *ligula*, spoons "with bulbous probes for mixing and applying ointments and disk heads for extraction," but is not always possible to say which instruments were used for medical practices and which for toiletry.[122] Portable mortar-and-pestle sets have been found in Britain, probably once strung together with a leather loop and a bag holding pellets for cosmetic purposes. The slender, curved pestle could have been used to crush various substances and then apply the powders to eyebrows and lashes.[123] But it is clear that these sets could have had a different, even medicinal, function: another indication of the conflation of *medicamen* as cosmetic and remedy, both a series of controls over the body.

V. Poison

The ancients were aware that at least two cosmetic substances were also poisonous: red and white lead and mercury sublimate. Pliny described white lead as lethal if it were ingested; the substance was thus especially dangerous in cosmetics as it could be easily swallowed.[124] Vitruvius noted that white lead was harmful to the human body and that workers in lead had complexions affected by pallor: "for when, in casting [pipes], the lead receives the current of air, the fumes from it occupy the members of the body, and burning them, rob the limbs of the virtues of the blood."[125] Although the ancients believed it improved the complexion, to judge from comparative evidence, skin treated with *cerussa* soon lost its youthful tone.[126] Cosmetics in antiquity thus both contributed to and skillfully concealed the devastation of the complexion.

"little jar;" see M. L. Trowbridge, *Philological Studies in Ancient Glass* (Urbana, Ill., 1930) 159–60, 163–64; Plin. *HN* 13.21 and 20.152. At Mart. 6.35.3, an *ampulla* is used as a water goblet. For this type of glass jar, see O. Vessberg, "Roman Glass in Cyprus," *Opuscula Archaeologica* 7 (1952) 145, type AIIa, and pl. III #9–16; A. von Saldern, *Ancient Glass in the Museum of Fine Arts, Boston* (Boston 1968) 48; and G. Ferrari et al., ed., *The Classical Collection at the Smart Museum of Art, University of Chicago* (Chicago 1998) 178.

[122] Allason-Jones (above, n.65) 131–32 and fig. 46.

[123] See Jackson (above, n.120). None of the grinders have been found outside Britain, but those in Britain have a Roman date. In addition, chatelaines have ointment scoops, nail cleaners, and tweezers: see Allason-Jones (above, n.65) 131 and fig. 46. I can find no ancient evidence for slaves chewing cosmetics prior to application on the mistress, contra Forbes (above, n.1) 41; and Green (above, n.1) 388.

[124] Plin. *HN* 34.175–76: *letalis potu*. See T. Hodge, "Vitruvius, Lead Pipes and Lead Poisoning," *AJA* 85 (1981) 486. For white lead which has been swallowed, Celsus recommends drinking mallow or walnut juice rubbed up in wine (*contritae*; *Medic.* 5.27.12B).

[125] Vitr. 8.6.10; 8.6.11: *Namque cum fundendo plumbum flatur, vapor ex eo insidens corporis artus et inde exurens eripit ex membris eorum sanguinis virtutes.* See also Celsus *Medic.* 5.27.12B; Diosc. *Materia Medica* 5.103; and Galen *Antidotes* 14.144. See Hodge (above, n.124).

[126] Dio Chrysostom, for example, wrote that white lead was employed to counterfeit youthfulness (*Eub.* 117). Tracts in fifteenth-century Italy and sixteenth-century England warned women about the harmful effects of makeup, which contained mercury sublimate. Grieco (above, n.103) 60 states that the substance may have been partially responsible for the "fast fading of youth and beauty bewailed by the ladies of Queen Elizabeth's court." The safety of white lead as a cosmetic was further questioned in eighteenth-century France by the newborn chemistry industry, which determined

As a final observation, many *medicamina* had an additional function besides their cosmetic or medicinal purpose: the materials that women used to paint themselves were often the tints used by ancient artists.[127] Soot or ash, used by women to line their eyes, was also collected and used by fresco painters;[128] *melinum* and white lead were employed as paints.[129] Chalk was an artist's element in mixing certain artificial colors (Vitr. 7.14). Materials used as rouge were also used as pigments in portraits and in fresco-painting, red ochre or *rubrica*,[130] red lead.[131] This is intriguing in view of the fact that it is possible to view the Roman woman of love elegy as an artistic construction, something noted by several scholars.[132] She literally constructed herself as an art object using even the same materials as artists.

VI. Conclusions

The purpose of this essay has been to point out the diverse functions of cosmetic substance in Roman antiquity. The words *medicamentum/medicamen*, terms most often used to mean "cosmetic," also referred to a remedy or a poison. Most substances used by the Roman woman on her face (white lead, *oesypum*, antimony, *crocodilea*, *melinum*) were also employed as remedies by the ancients. Some were poisonous: white lead, for example. It is interesting as well to

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the substance "incurably impairs and spoils the complexion" (G. Vigarello, *Concepts of Cleanliness: Changing Attitudes in France since the Middle Ages*, tr., J. Birrell [Cambridge 1988] 79–80, 134). Although a government study in England in 1724 determined that the lead, arsenic, and verdigris in women's cosmetics were poisonous, "the popular and scientific press offered more advice on how to contend with the consequences of harmful beauty remedies than it did warnings against their use" (S. Romm, *The Changing Face of Beauty* [St. Louis 1992] 218).

[127] On ancient pigments, see most recently P. M. Allison, "Color and light in a Pompeian house: modern impressions or ancient perceptions," in A. Jones and G. MacGregor, eds., *Colouring the Past: The Significance of Color in Archaeological Research* (Berg 2002) 195–207.

[128] Vitr. 7.10.3; see Allison (above, n.127) 202–3.

[129] Vitr. 7.7.3, 7.12; Plin. *HN* 35.30; see Alison (above, n.127) 201.

[130] Plin. *HN* 35.35; Hor. *Sat.* 2.7.98; Vitr. 7.7.2.

[131] Vitr. 7.12.2; see Alison (above, n.127) 201 (reds), 203 (purple).

[132] Wyke *Mirror* (above, n.1) states that "the adorned woman constructs herself as a work of art to which aesthetic categories may be applied" (145), and that "disparagement of care for the female body and, therefore, of the woman who practices it, is least in evidence where the discourses of adornment associate woman with art" (143). She also notes that this mainly occurs in the works of Ovid (145). S. Currie ("Poisonous Women and Unnatural History in Roman Culture," in M. Wyke, ed., *Parchments of Gender: Deciphering the Bodies of Antiquity* [Oxford 1999] 147–67) states that, "Ovid constructs an elaborate analogy between the female application of cosmetics and artistic creativity" (166, on Ovid *Ars am.* 3.219–225). E. Downing ("The *Praeceptor* in *Ars Amatoria*, Book 3" in J. Porter, ed., *Constructions of the Classical Body* [Ann Arbor 1999]) states that: "[T]he *praeceptor* dresses his student in an attempt to assimilate natural woman to an artificial realm of counterfeit appearances, to make an art object" (239 and *passim*). M. Myerwitz (*Ovid's Games of Love* [Detroit 1985]) also assumes that women are works of art (135), that Ovid is urging women to turn themselves into works of art (but that a "natural look" is aimed at: see Downing [above] 249–50, n.21 for criticisms). See also Sharrock (above, n.1). On *ars* and *cultus* in Ovid *Ars am.* 3, see most recently Gibson (above, n.13) 128–48, 175, 183, 186–91.

note that there were no materials that operated purely as cosmetics in Roman antiquity—many in fact functioned primarily as medicines or pigments, and only secondarily as cosmetics. Few cosmetic substances could be considered repellent on their own. Modern scholarship on ancient cosmetics and the status of women does not note that most beauty preparations functioned as *medicamina* generally, not just as cosmetics for women (and note that many of Pliny's skin-care recipes do not specify whether the facial troubles belong to women or men). These diverse uses and views of the substances a woman put on her face help highlight the ambivalence with which an adorned or painted woman herself was viewed. Figuratively, cosmetics were a remedy used to palliate an appearance which was less than ideal; but makeup was also a poison which, if used in the wrong way, could harm a woman's sexual and social standing: thus, cosmetics could be seen as both ideological and physical toxin.[133]

The many recipes for female skin creams and washes hint at the ideal of the female complexion current in Roman society, and how difficult it must have been for most women to achieve. But however strong the prevalent ideal of a smooth, bright female complexion was in Roman antiquity, one author, at least, chided women for succumbing. Martial reproved a friend for writing epigrams that were too perfectly bland and "white," like a face plastered with lead; such a face, he states, is featureless and uninteresting, and needs a blemish or dimple to hold a viewer's attention.[134]

University of Western Ontario KELLY OLSON
kolson2@uwo.ca
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[133] On which see Richlin (above, n.1) 200.

[134] Mart. 7.25.2, 6: *et cerussata candidiora cute / . . . / nec grata est facies cui gelasinus abest* ("whiter than a white-leaded skin . . . even a face without a dimple fails to please"); *gelasinus* means a dimple which appears when someone laughs. But elsewhere, he advises a woman not to conceal a small or insignificant blemish lest it be thought bigger than it really is (3.42.1).

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History and Utilization of *Rosa damascena*[1]

Mark P. Widrlechner[2]

This report traces the historical literature on the development of the damask rose industry. It begins with a sadly sparse fossil and archaeologic record and continues to the present. The perfection of methods for the production of attar and rose water from Rosa damascena *is reviewed, as are cultural practices and current research programs.*

The various arguments to explain the evolution of Rosa damascena *are presented along with accessory information needed to evaluate them critically. Evidence is presented to support the theory that* R. damascena *was originally an eastern Mediterranean hybrid between* R. gallica *and* R. phoenicia.

It is unfortunate that so few botanists have been willing to study this domesticate, as too many horticulturists have been concerned only with cultivation and higher yields. Most of the current literature on this species is either inaccessible, because of language or general unavailability, or of a popular nature and therefore difficult to evaluate. It is hoped that this review will encourage more research on industrial roses and aid those who wish to search the literature. May it also suggest to crop evolutionists that much work remains to be done on the subject of the domestication of ornamental and medicinal plants.

The cultivation of roses for many purposes has been widespread in temperate climates throughout the world. They are best known for their beauty as cut flowers and as garden ornamentals, but roses have agronomic uses as well. Many volumes have been written about garden roses, but the roses used for food and industrial products have been less widely described in the scientific literature. This report examines one of those roses, the damask rose, *Rosa damascena* Miller.

For the perfume industry, *Rosa damascena* is the most important species for the production of attar of rose, made by distilling volatile oils from the flowers. It is also used widely in the manufacture of rose water, a flavoring agent. The culture of this rose and the manufacture of these products form a significant segment of the agricultural economies of Bulgaria and Turkey and are locally important in other parts of the Middle East and eastern Mediterranean region.

Topics reviewed herein, in relation to the economic development of *R. damascena,* include: the history and future potential of rose products, theories about domestication and evolution, cultural practices, and current research programs.

The records of the eastern Mediterranean region are most closely examined, as that region is the center of production and also a postulated center of origin for this rose. Thirty-one species of *Rosa* are found wild in Turkey; and Mandenova (1970) described Anatolia as a major center of rose differentiation. Most attempts at establishing large scale attar production outside of the region have not met with great success, which does not seem to agree with the generalization

[1] Received 27 June 1980; accepted for publication 4 September 1980.

[2] Department of Horticultural Science and Landscape Architecture, University of Minnesota, St. Paul, MN 55108.

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that plant domesticates usually perform better away from their ancestral lands (Jennings and Cock, 1977).

On one level the generalization does apply, because today's main production centers in Bulgaria and Turkey are removed from the species actual center of origin. *Rosa damascena* was intentionally introduced into Bulgaria in historic times, creating geographic isolation from the center of origin. Three hundred years later, it was then reintroduced into Turkey, creating a temporal separation allowing for selection and new adaptations.

On a more global scale, however, the generalization does not apply, for one finds that the specialization and intensity of labor required to cultivate it successfully and, more importantly, to harvest and process the flowers are rarely found in areas not presently involved in the manufacture of perfume from plant materials.

HISTORY OF ROSES AND ROSE PRODUCTS

Prehistoric and archaeologic

The oldest fossil roses are described from the Paleocene (Hollick, 1936). *Rosa* is a genus which dispersed widely in the Oligocene and began a process of diversification that continues today; but it is impossible to correlate fossil roses to present-day species by solely using vegetative characteristics, and unfortunately the fossil record is quite deficient in floral remains and even fruits are rarities. The lack of well-differentiated fossil leaf types caused Becker (1963) to identify all rose remains as a single species, *Rosa hilliae* Lesq.

Little archaeologic evidence of roses has been found. Casparie et al. (1977) discussed the finding of rose seeds at an inhabited site of the early Neolithic (ca. 5,000 B.P.) near Swifterbant in the central Netherlands. They suggested that humans were intentionally collecting rose fruits for food along with other fruits and nuts including *Corylus, Pyrus, Crataegus,* and *Rubus.* Masses of rose seeds have also been described from Swiss sites (ca. 3,500 B.P.) and in Britain (Renfrew, 1973).

The oldest known tangible historic evidence for the existence and possible use of roses comes to us from the Minoan civilization. The evidence is in the form of remains of a fresco from the palace at Knossos, Crete (ca. 3,700 B.P.). Sir Arthur Evans (1901) first described it in his work, *The Palace of Minos,* and named it the Blue Bird fresco. One rose drawing is preserved in the fragments. The identity of the flower was confused, as Sir Arthur described it as a "golden rose color." Modern reproductions often incorrectly show the flowers to be yellowish (Shepherd, 1954). R. Hurst (1967) saw the original in the Heraklion Museum and noted that the flowers were pink. C. C. Hurst (1941) believed that the rose bore a "striking resemblance to the Holy Rose of Abyssinia, Egypt, and Asia Minor," which he identified as a natural hybrid of *Rosa phoenicia* Boiss. and *Rosa gallica* L. These 2 species have ranges that overlap in the eastern Mediterranean region. The hybrid, also known as *Rosa* × *Richardii* Rehd., is similar to *R. damascena,* the major rose for attar production in the region, and may be of the same genetic stock, but it has fewer petals and a dwarf habit (Rehder, 1940). As for the hybrid's spread, C. C. Hurst (1941) theorized how it may have been introduced into Ethiopia, where it is today grown beside churches, by the proselyting of St. Frumentius of Phoenicia (ca. 300 A.D.).

Remains of *R.* × *Richardii* were also found by Flinders Petrie (Newberry, 1889) in the cemetery of Hawara, in the Fayum province of Lower Egypt, dating from the age of Christ. The fine condition of these remains was most amazing. The flowers were picked in bud and made into a wreath; they dried without disturbing a stamen.

Roses are also pictured in the murals of Pompeii. Floriculture had become well developed by that time (ca. 50 A.D.), and many of the flowers are depicted there in conjunction with the flower industry (Jashemski, 1963). Jashemski did not go so far as to identify the kind of roses pictured. Unfortunately, the figures in the article do not have the clarity necessary for one to make specific identifications.

Early literature

The oldest possible written record of roses would be expected to occur in the Assyrian cuneiform tablets (ca. 4,200 B.P.). However, the Assyrian word for rose has not been adequately defined. Thompson (1949) thought *kasî ŠAR* to be the word, after consulting Assyrian medical tablets and comparison with other ancient pharmacopoeias. Landsberger and Gurney (1958) reexamined such definitions in their *Practical Vocabulary of Assur.* Their interpretations of its uses led them to believe that *kasî ŠAR* was probably *Sinapis nigra* (=*Brassica nigra* L.). The only thing *Brassica* has in common with *Rosa* is its wide variety of medicinal uses. However, that crucifer has no thorns and *kasî ŠAR* was supposed to be a thorny plant. The matter deserves further consideration.

By the time of Herodotus (ca. 500 B.C.), the rose was commonly mentioned in literary works. In Herodotus' *Histories* (VIII-138), King Midas grew many-petalled roses of the finest scent in his gardens of Phrygia, now west central Turkey. The oldest horticultural literature extant on roses is that written by Theophrastus (ca. 300 B.C.). *Enquiry into Plants* is his major surviving work, and in it he described the different types of roses in the eastern Mediterranean region. At that time, well-differentiated cultivars were being grown, including plants with more than 20 petals per flower. In Sections VI, vi. 4–6, he discussed their cultivation: "the plant comes slowly from seed, they make cuttings of the stem . . . if the bush is burnt or cut over, it bears better flowers; for, if left to itself, it grows too luxuriantly and makes too much wood." This procedure would remain rather constant for 4 centuries, for Varro gave these instructions for propagation—"take a plant which has already struck root, and cut the stem, beginning at the root, into slips a palm-breadth long, then cover with earth and transplant them when they too have made a living root."

Theophrastus also related other important information; he distinguished wild roses (*kynosbaton* = dogrose) from cultivated types (*rhodon*). And in *Concerning Odours,* Sections 14–47, he wrote of the manufacture and properties of perfumes. He stated that "sesame-oil . . . receives rose-perfume better than other oils." A similar enfleurage of roses with sesame seeds and the expression of their oils is used today in the manufacture of Gulroghan Hair-Oil in India (Pal, 1966). Also great quantitites of salt were added to the perfumed oil to prevent decay, as explained in the *Greek Herbal of Dioscorides* (I,53). The product was dyed red, possibly with alkanet, *Alkanna tinctoria* (L.) Tausch. (Grieve, 1931), and recommended for use by men (see *Concerning Odours,* Section 42).

There has been much discussion about the many-petalled roses of the Greeks and their contemporaries. They were described as *rosa centifolia* by Pliny; and it was formerly believed that this *rosa centifolia* was the species *Rosa centifolia* L., the old cabbage rose (Bastock and Riley, footnote in Pliny, 1855; Anonymous, 1895). However, the cabbage rose does not appear in European art until the 1600s in Holland (Thomas, 1955). C. C. Hurst (1941) believed the cabbage rose to be of hybrid origin, developed in Western Europe by the fledgling floral industry of the late Middle Ages. Darlington (1973) thought it was bred in Holland in the seventeenth century. It has qualities of 4 species: *Rosa gallica, R. phoenicia, R. moschata* Herrm., and *R. canina* L. *Rosa centifolia* also is not very fertile; some cultivars have been found to be triploid (3n = 21), suggesting a complex hybrid origin.

What then was this many-petalled rose of the ancients? Krüssmann (1977) believed that it was a double form of *R. gallica* as did C. C. Hurst (1941). Shepherd (1954) expressed scepticism of Hurst's arguments about the recent origin of *R. centifolia*: "It seems incredible that a rose as distinctive as *R. centifolia* should suddenly appear in Holland and in Southern France, in such large quantities as to cause it to be considered native . . . . The possibility the *R. centifolia* is a hybrid of very ancient origin cannot be discounted entirely with the present evidence so obviously incomplete." Shepherd (1954) reported that plants similar to *R. centifolia* had been found in the Caucasus by von Bieberstein, but the species is not listed as occurring in the wild in either the *Flora of the USSR* (Komarov, 1940) or *Flora of Turkey* (Nilsson, 1972).

The Romans continued the literary tradition of the rose established by the Greeks. Billiard (1928) gave a brief summary of the literature, but did not supply much interpretation. Pliny gave the most comprehensive description of roses presently extant from that age (ca. 50 A.D.). In Book XXI, Chapter 10, of *Natural History,* he described 12 varieties, naming them by locality. It is impossible to assign species names to these 12, as the descriptions are not detailed enough. He had developed a taxonomic system in which, "The essential points of difference in the rose are the number of petals, the comparative number of thorns on the stem, the color, and the smell." The cultivars were so developed that there existed one known as *Graecula* that never fully opened. Pliny described the plants' propagation and also correlated the soil and climate with the perfume produced.

Pliny commented upon the subject of pharmacognosy. He listed 32 remedies derived from roses (Book XXI, Chapter 73). He wrote of the astringent and laxative properties of the petals. In Spain their use for such effects is still common. Speaking of the glories of rose petals, Font Quer (1973) went far in stating, "Ansí que me resuelvo a decir que es la más saludable y católica medicina de cuantas Dios crió para el uso de los mortales." (And thus I resolve to say that it is the most wholesome and comprehensive medicine for human use from all that God grows. (author's translation))

Pliny was also the first to give us a recipe for the concoction of rose wine, where rose leaves are added to grape must in the ratio of 40 drachms for every 20 sextarii. This product was then aged for at least 3 mo. Perhaps the Romans chose a rose with fragrant leaves such as *R. rubinigosa* L. (Gordon, 1953; Staykov, 1971).

Columella, a contemporary of Pliny, made mention of roses in his agricultural work, *De Re Rustica,* but only of their planting, care, and the sale of their flowers, which he learned from experience as a gentleman farmer or from Varro's treatise *On Farming*. Thus his encouraging description for potential rose merchants, "Et titubante gradu multo madefactus Iaccho, Aere sinus gerulus plenos gravis urbe reportet" (Chapter X, 305–310). (Thoroughly soaked with wine and with staggering steps, the carrier returns from the city, bringing back a filled purse heavy with coins. (author's translation)).

The rose industry was quite advanced in Rome at the time of Pliny; roses decorated houses, and were occasionally strewn through the streets. The Romans had a festival, Rosalia, to celebrate and honor the rose. The extravagant use of roses seemed boundless. Suetonius, in *Nero* (Chapter 27), told the story of a banquet given to Nero where the roses alone cost more than four million sesterces, more than $100,000! But the translation of this passage has been questioned (Anonymous, 1895). Perhaps that section described the gift of rose plantations, by defining *rosaria* in a broader sense.

Martialis, in *Epigrams*, vi. 80, xiii. 27, wrote, "The rose was once the flower of Spring; now she is wholly Caesar's flower." This lament is indicative of the increasing commercialization and marketing of roses to the patricians, and it makes one wonder how they were supplied with such quantities of Caesar's flower. Egypt was one of the suppliers. Roses were unknown in that country prior to 631 B.C. (Krüssmann, 1977), but were grown there in increasing quantities after 300 B.C. Theophrastus, in *Enquiry into Plants*, Section VI, viii. 5, described how roses flowered 2 mo earlier in Egypt than in Greece. This earliness gave incentive to commerce, to supply Romans with the first roses of the year. But Roman rose-lovers were not to be outdone; forcing techniques were well known (Pliny, Book XXI, Chapter 10).

One of the centers of Roman rose production was the Campanian plain, noted for its remontant, or reblooming, roses. The only remontant rose in Europe until the Middle Ages was *R.* × *bifera* (Poiret) Pers., the autumn damask rose (C. C. Hurst, 1941). It is considered to be a hybrid between *R. gallica* and *R. moschata.* The first literary reference to remontant roses occurs in the tenth century B.C., on the island of Samos, but Hurst's theory must be viewed with some caution as the present range of *R. moschata* lies far to the east. For more on remontant roses and floriculture on the Campanian plain, consult Jashemski (1963) and Billiard (1928).

The ancients employed the processes of enfleurage and maceration to obtain their perfumed oils (Naves and Mazuyer, 1947), but what of rose water and the precious attar?

Rose water and attar

The discovery of rose water is not recorded in history; the first reference to it is found after its production was already an established industry. Ibn Khaldum stated that the province of Faristan, in Iran, was required to give a tribute of 30,000 bottles of rose water annually to the Caliph at Bagdad for the years 810–817 A.D. (Perry, 1925). Istakhri described the export of rose water from Faristan to China and throughout the Islamic world. The first European reference to rose

water is in *Le Calendrier d'Harib* (for 961 A.D.) (Sawer, 1894), which recommended that rose water and other rose products be prepared in April. In the tenth century A.D., the Moors probably brought the technology for rose water production to Spain along with their territorial expansion.

The distillation of the attar from rose water came later and probably arose independently in Europe and the Arab world. Wecker, in 1574, named Geronimo Rossi of Ravenna as the first to accomplish it (Flückinger, 1867). Flückinger also showed that the attar, *Oleum rosarum destillatum,* appeared in the price lists of German apothecaries of the 1600s.

In India a more romantic tale of the origin of attar is told. Manucci (ca. 1680), citing Mohammed Achem's history of the Grand Moguls from 1525–1667, *Tarykh monekheb lubab,* described the feast of the seventh year of the reign of Djihan-Guyr, where "The princess (Nour-Djihan) indulged her luxurious caprice so far as to have a canal circulating round the garden filled with rose water. Whilst the emperor was walking with her along the banks of this canal, they perceived a kind of scum floating on the surface of the water, and realized that it was something from the roses which the heat of the sun had caused to separate from the water (through evaporation) and to aggregate in a small mass. Everybody agreed that it possessed the most delicate perfume known in India." The feast took place in 1612, and the distillation in Persia dated from the same year.

Spread of production and usage

Attar quickly became popular and by the end of the 1600s the distilleries at Shiraz, Iran, were a major industry. The cultivation of roses for attar spread to the east and west from Persia, as is evidenced by the fact that the word *attar* is borrowed from the Turks; and in Farsi, *aettr* originally meant fat (Orozoff, 1906). The related Hindi word *itr* describes a product made by absorbing rose flower distillate in oil of sandalwood (Pal, 1966). In modern Turkish, the attar is known as *gul yagi*; *gul* is also from Farsi, where it means flower but is often applied to the rose. The Russians, Ukranians, Romanians, and Bulgarians have all adopted the Turkic attar in various forms, showing how the industry has spread. Other Indo-European languages, with the exception of English, use their own word meaning oil or essence.

The rose that was grown most often for attar production has been *R. damascena,* the damask rose, or some similar species. The evolution and phytogeography of the damask rose is discussed in the third section of this paper. As for linguistic evidence of this rose's spread, the appellation, damask, refers to Damascus, although that name can only be traced back to the Crusades. Compte de Brie has been credited with bringing roses to France from the east around 1270 (Shepherd, 1954). But Shepherd also stated that the first writing of *rosa damascene* was not until the 1500s. The Spanish also knew this rose as *la Rosa de Alejandria* (Mas-Guindal and Mas-Guindal, 1944), perhaps dating back to the Moorish occupation.

At the close of the seventeenth century, a Turkish merchant introduced rose culture into the province of Eastern Roumelia (now part of Bulgaria) (Orozoff, 1906), and began the largest rose plantations in the world, growing *R. damascena*

along with the more cold tolerant *R.* × *alba* L., which gives a lower quality attar (Guenther, 1952; Igolen, 1966).

In India, roses were grown commercially in Uttar Pradesh, which remains the center of Indian attar production. The variety 'Bussorah' or 'Barwana' of *R. damascena* is the most important (Pal, 1966).

The introduction of *R. damascena* to Israel was not without impact on the local economy. Gilad (1975) wrote, "The growing of Damask roses in Israel created a revolution in gardening, and the Damask rose quickly conquered the first place of all roses which were praised in the times of the 'Mishna' (Middle Ages)." Jericho and Jerusalem were centers of cultivation, and a full range of rose extracts were produced. The beauty of the Jericho roses was extolled by Felix Fabri in 1480. By the 1800s the fields had gone wild and production declined. Baron E. de Rothschild tried to reestablish a modern rose oil industry in the late 1800s, but manufacturing difficulties and pathogens halted production in 1905, and it has not resumed (Gilad, 1975). In more recent times, the culture of roses in Israel has expanded greatly. A variety of cultivars are being grown for cut flowers to supply a growing export market.

A singular mystery in the distribution of *R. damascena* involves Turkey. In the 1600s and 1700s, Turks and Arabs were spreading the rose industry throughout their domains, but for 200 yr the record in Turkey is silent. *Rosa damascena* was introduced *into* Turkey in 1894, by a Bulgarian emigrant from Kazanlik (Bredemann, 1917). Rose culture became established in Burdur and Isparta, which continue as the primary districts of Turkish production.

Bursa, a vilayet of northern Turkey, also grew a few native roses called *Hafis*, that produced many small, dark red flowers on thornless stems, but the oil was of an inferior quality and the Turkish government worked to eradicate it to discourage its use as an adulterant (Igolen, 1966). This rose was probably a type of *R. gallica*, as none of the other native roses that would grow wild at Bursa has dark red flowers (Nilsson, 1972).

During the Middle Ages, the Islamic world was first enjoying vast quantities of rose water and later small, but increasing, amounts of attar. When Saladin retook Jerusalem from the Christians in 1187, he would not enter the Mosque of Omar, which had been used as a church, until it was purified by rose water. The rose water required the use of 500 camels for its transport from Damascus. Mohamet II demanded the same purification for the Mosque of St. Sophia, after his conquest of Constantinople in 1453 (Gordon, 1953).

Rose water also became a favorite flavoring material for desserts and beverages, which it remains today; for a good collection of recipes consult Smith (1973) and Gordon (1968). The Bulgarian government now makes a carbonated beverage, *Etur*, flavored with the essence of rose and other fruits (Komitet po Kachestova Standartizatsiyata i Metrologiyata, 1972). Rose flavoring is also popular in the confection, *rakhat-lukum* (Chechelashvili and Korinteli, 1971) and in preserves (Vurkhoven Suvet po Standartizatsiya, 1970).

The attar, because of its concentrated fragrance and prohibitive cost (up to $5,000/kg for Bulgarian attar in 1980 (Darnton, 1980)), has been used almost exclusively in the manufacture of expensive perfumes. For other purposes, volatile solvent extracts or inexpensive synthetic substitutes are available (Guenther, 1952).

CULTIVATION PRACTICES AND PRODUCTION

Culture

In Bulgaria roses are planted together to form long hedges, which grow to 2 m. They are propagated by division of the crown. The divisions are planted in fall and 2 yr later are productive, with maximum production at about the fifth year (Orozoff, 1906). The largest hectarage is found in the Strema and Toundja river valleys, north of the Sredna-Gora range. *Rosa* × *alba,* a later introduction used to demark the borders of the fields, and *R. damascena* live "in harmonious Yorkist-Lancastrian co-existence," as Gardiner (1970) stated.

The fields are pruned in March before new growth appears. And the lanes between the shrubs are cleared in spring and fall. In the Bulgarian valleys, rainfall is adequate year round making irrigation unnecessary (Sawer, 1894).

The Turkish plantations are started by making trenches 40 cm deep by 40 cm broad and 1.5 m apart. The propagules are placed in the trenches, spaced about 50 cm apart. In 2 yr the plants should grow to a height of at least 1.5 m. The plantation can last 30 yr with yields of 3,500–5,000 kg of flowers per ha, twice the yields of *R. centifolia* in Grasse, France (Garnero et al., 1976).

Burdur and Isparta, the Turkish production centers (approx. 1,350 ha under cultivation), have sufficient moisture and are partially forested, thus supplying the wood needed for peasant attar stills (see next section) (Igolen, 1966). In Isparta, the plants are watered in the autumn to supplement rainfall. Most of the growers fertilize with sheep manure. Although ammonium sulfate and superphosphate are recommended, they are too costly.

Pathogens and other pests that damage rose plantations are much the same throughout Europe and western Asia. Garnero et al. (1976) listed them along with the pesticides commonly used. The pathogens include the fungi, *Phragmidium subcorticium* (Schrank) Wint. and *Uncinula necator* (Schw.) Burr. (which is surprising since *Sphaerotheca* spp. and not *Uncinula* spp. usually are the most common powdery mildews on *Rosa* (U.S.D.A., 1960)), and insects include the aphid, *Macrosiphum rosae,* and especially *Agrilus aurichalceus,* a beetle with larvae that can deform rose stems. In May 1974, *Agrilus* larvae destroyed whole fields in Turkey (Garnero et al., 1976).

Processing

Until recent times the processing of the flowers was done in small scale operations. The "peasant processing" varied greatly. When spring comes to the rose fields, they quickly become pink seas and the rose pickers must work quickly. The harvesting period is short and dependent upon the whims of nature. In a cool, cloudy spring, it may last for a month, while in hot seasons, for only 16–20 days (Orozoff, 1906; Perry, 1925).

Each day before dawn the workers go to the field and collect freshly opened blossoms. The collection stops when the sun dries the dew on the flowers. The oil yield is significantly lower if the flowers are picked after 0900 hours (Igolen, 1966).

The flowers are brought to stills (made variously of copper or iron sheet metal) and mixed with water. The distillate is then collected in metal tubing cooled by water. The primary distillate is usually redistilled, and various distillates mixed

to obtain the desired properties (Garnero et al., 1976); in Kashmir multiple distillations were common (Tschirch, 1917). The attar is skimmed from the surface of the combined distillates, the remainder of which is used as rose water. The wood required to fuel the stills to manufacture 1 kg of essential oil (attar) is about 2,000 kg; and the ensuing deforestation creates grave erosion problems and competes with the use of wood as a home fuel.

The residue of processed petals is then compressed and dried. Bulgarian researchers have been experimenting with ways to obtain essence from these residues by chemical and microbiological methods (Kupenov et al., 1971).

The industrialization of these processes was begun, first by standardization and expansion of the peasants' equipment, but then by new large scale factories. The first volatile solvent treatment factory was built by Charles Garnier in 1904 at Kara Sarli, Bulgaria. After World War I, 6 more factories were built, 3 of which were still operating in 1939 (Naves and Mazuyer, 1947). Both steam stills and volatile solvent extraction systems are used commercially in Bulgaria (Guenther, 1952). Solvent extraction is more commonly used for *R. centifolia* in France and north Africa, because its flowers are not adapted to water distillation.

The Turks started large scale processing in 1926 with the construction of a factory in Isparta with 6 stills with a combined capacity of 4,000 l (Igolen, 1966). Both the static and, more modern, rotary extraction units were installed in the region in the 1950s. Better testing and an increase in the percentage of industrially-produced attar have improved the export outlook of Turkish attar since 1965 (see below).

In Bulgaria the government collectivized the rose farms after World War II. In 1945, it also centralized and nationalized the distilleries, creating a national production and marketing enterprise, Bulgarska-rosa (Guenther, 1952). The old copper stills are used no more and Bulgaria remains a world leader in the production of the attar of the damask rose (Gardiner, 1970).

Output and exports

The first modern export records available are for exports from the Ottoman Empire, to England and France for 1860 (Farley, 1862). At that time, the Empire included Bulgaria; and a total of 1,110 kg of attar was exported.

The next Turkish figures are from the newly founded industry for 1913. Ravndal (1926) stated that 273 kg of attar were produced. No mention was made of export figures. In more recent times, Turkish production has increased markedly, although Turkey suffers the burden of producing rose extracts that are considered by much of the perfume industry to be somewhat less desirable than those from Bulgaria due to less stringent production controls (Igolen, 1966). In the period 1962–1965, about 1,200 kg of attar were exported annually (Garnero et al., 1976), and for 1970–1973 about 2,800 kg. The 1973 export value was about $1,405,000 (13 TL = U.S.$1), and this made up about ½ of 1% of total Turkish export value (Devlet Istatistik Enstitüsü, 1974). Rose water is also exported: in 1972 over 6,000 kg, but it is much less valuable. Persia used to export great quantities of rose water to India, over 200,000 kg in 1891 (Tschirch, 1917).

Orozoff (1905) listed Bulgarian attar production of 2,142 kg in 1899, 4,076 kg in 1903, and 4,197 kg in 1904. His figures by weight for exports, in those same

years, were higher than production. Either large scale storage of attar, unaccounted for production, or adulteration may make up the difference.

World War II had an impact on Bulgarian rose production. In 1939, 6,300 ha were devoted to rose culture; whereas in 1948, this declined to 2,000 ha (Rochlin, 1957). Since the War, culture has expanded somewhat; a more detailed description may be found in a report by Topalov and Irintchev (1967). Levels of export for attar, the product of steam distillation, and the concrete, resulting from volatile solvent extraction, continued to decline in the 1950s. Only 523 kg of attar were exported in 1960, but this rose to 1,831 kg in 1968, nearly equaling Turkey's exports (Bulgaria-Tsentralno Statistichesko Upravlenie, 1969). In 1971 exports were 1,298 kg of attar and 1,385 kg of the less valuable concrete (Bulgaria-Tsentralno Statistichesko Upravlenie, 1972). The principal destinations of these products were the USSR, France, and the United States.

CURRENT RESEARCH

Research programs dealing with *R. damascena* have expanded greatly in recent years. In Bulgaria, the Research Institute for Oil-Bearing Roses, Aromatic, and Medicinal Cultures at Kazanlik has worked to improve the local cultivar 'Kazanlik.' This rose has variable clones, which are being examined for selection (Astadjov, 1975a). The selection 'Iskra' (Astadjov, 1975b) has been released. It surpasses average yields, measured in terms of the weight of blossoms per hectare, by over 90%.

Milewski leads a long-term rose breeding program in Poland and has used *R. damascena* as a parent for the creation of a multipurpose cultivar 'Memory of Wiesław Milewski' (*R. damascena* × *R. rugosa* Thunb.). This cultivar is ornamental, has good fruit production, and also has flowers which can be used in confectioneries (Milewski, 1975). Milewski and Mrożewski (1958) discussed, in more detail, the use of rose petals in the confection and baking industry.

A breeding and testing program has been in progress since 1962 in the Soviet Union. The selection 'Crimean Red' has been grown along the Black Sea since 1926, when Gunko selected it at the Nikitshii Botanical Garden (Nazerenko, 1974). This may be a *R. damascena* or perhaps *R. gallica*. Two of the best new cultivars are 'Michurin' and 'Festival.' Their oil yields were about twice as great as 'Kazanlik' and 'Crimean Red' for a 9-yr test conducted by the All Union Scientific Research Institute. The cultivar 'Michurin,' a hybrid between 'Kazanlik' and 'Crimean Red,' was found to be high yielding in Moldavia and the Krasnodar border region. It is similar in appearance to 'Kazanlik,' but is shorter, and the flowers have more petals on the average (Nazerenko, 1974; Astadjov, 1975a). 'Festival' is also a hybrid of the same parentage. It grows 1.5–2 m tall and has redder flowers than 'Kazanlik.' Nazerenko was enthusiastic about the impact of these new hybrids: "The wide introduction of high yielding varieties permits great enhancement of rose oil production, for all production zones of this valuable aromatic oil." (author's translation)

The future of *R. damascena* and other plants grown for labor intensive perfume production does not merely rely on plant breeding programs, although breeding and research are definitely important to the survival of the industry. Two of the most vulnerable links in attar production are labor and competition. Large

amounts of semiskilled labor must be available for a few weeks of the spring. During the rest of the year, the area may not be able to support such a labor force. As for competition, synthetic chemicals are increasingly important to the perfume industry. High prices for attar encourage substitution and efforts to increase natural oil production may not be enough to overcome this trend and expand output.

With regard to expanding production in other parts of the world, training field and laboratory workers would be a major obstacle as would land availability. *Rosa damascena* requires land that would normally be used to produce food crops. Although the rate of monetary return might be higher in the long run from a rose plantation, the combination of taking land out of food production and delayed return from capital investment would discourage expansion into many otherwise suitable parts of the globe.

EVOLUTION OF *ROSA DAMASCENA*

Taxonomy and genetics

Two questions must be posed about *R. damascena* to make any discussion of its evolution useful. How is *R. damascena* different from other rose species? And, how does the work of humans fit into its development?

The first question is not a simple taxonomic query. The characters of many roses are noted for their intergradation. This has continually plagued the student of *Rosa*. One of the first rose taxonomists, Lindley (1820), went so far as to say that "our knowledge of European Roses has become, by the extraordinary attention they have received, so extensive that it is impossible to doubt that limits between what are called species do not exist." Through the diligent work of Crépin and Boulenger, a system of classifying Old World roses emerged. But there were still subjects that the rose taxonomist would not care to handle. Boulenger (1936) warned about *R. gallica,* a probable parent of *R. damascena* (of which he made no mention in any of his extensive studies), "Elle a produit beaucoup d'hybrides, qu'il est parfois très difficile de distinguer des formes pures." (It (*R. gallica*) has produced so many hybrids that it is sometimes very difficult to distinguish pure forms. (author's translation))

Most botanists agree that *Rosa damascena* belongs to the section *Rosa* (*Gallicanae*). This section contains the polymorphic species, *R. gallica,* found in both wild and cultivated forms, and a number of species that are likely either forms of *R. gallica* or hybrids between *R. gallica* and species of other sections. One must then ask how *R. damascena* differs from *R. gallica*. *Rosa damascena* is taller and more robust; the prickles are all nearly the same size; the inflorescences are usually many-flowered; and the fruit is oblong, not globose (Komarov, 1940; Willmott, 1912; Rehder, 1940). Willmott and Rehder stated that the leaves of *R. damascena* are glabrous, but Thomas (1955) disagreed, saying "all of the distinct Damasks do have a soft pubescence on the upper surface of their leaves." Shepherd (1954) discussed *R. damascena*'s special propensity for recurrent flowering, and used this character as a basis for his evolutionary theory. Another distinguishing character is the noted airborne fragrance of *R. damascena* blossoms. The fragrance of *R. gallica* is not so dispersed (Thomas, 1964).

The cytogenetics of the section *Rosa* have been extensively studied. Most

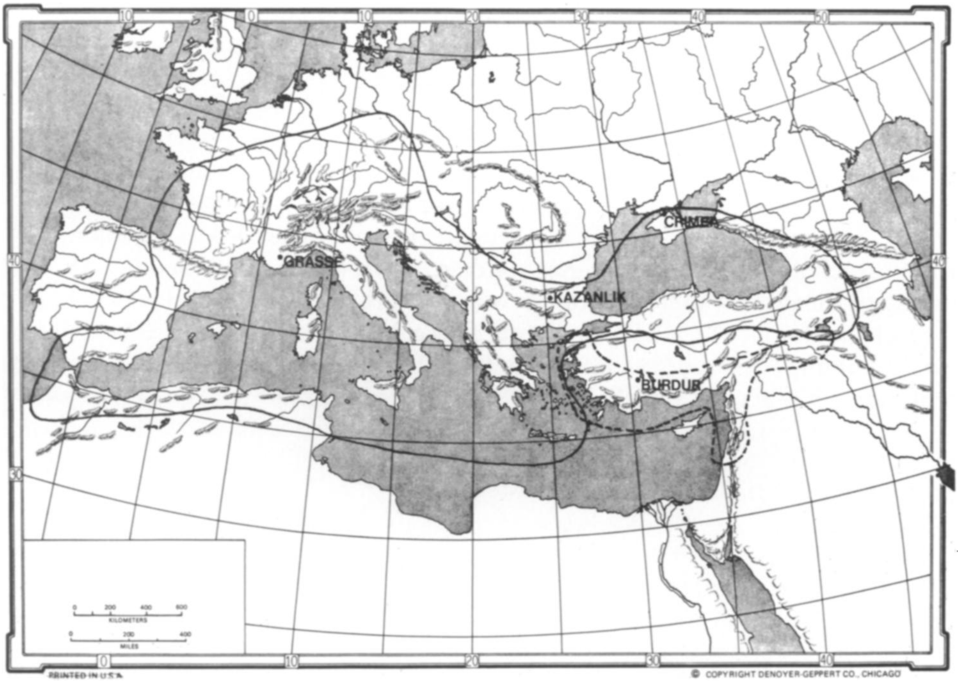

Fig. 1. Solid line = range of *Rosa gallica* L.; broken line = range of *Rosa phoenicia* Boiss.; dots = centers of attar production. Map © Denoyer-Geppert Co., used by permission.

cultivars are tetraploid with 28 chromosomes (Darlington and Wylie, 1955), but a few interesting exceptions have been noted. Suzuka (1953) found a diploid *R. damascena* and occasionally a triploid *R. centifolia* is found (C. C. Hurst, 1941). And the damask cultivar 'Omar Khayyam,' which was grown from seed sent from Naishapur, Iran, to Kew Gardens, was found to be pentaploid (2n = 35, ♀ = 21 and ♂ = 14).

Rosa damascena is usually propagated vegetatively; since the time of Theophrastus, one has been advised against growing roses from seeds. Shepherd (1954) noted that the seedlings from self-pollinations of *R. damascena* show great variability. Thus one might assume a hybrid origin. Crépin (1879) was the first to do so. He believed that *R. damascena* was an ancient cross between *R. gallica* and *R. canina* L. However, due to the unusual pentaploid genetic system of the section *Caninae* (Rowley, 1967; Darlington, 1973), *R.* × *alba* had been identified as a hybrid between section *Rosa* and *R. canina* (C. C. Hurst, 1941). *Rosa canina* is pentaploid (2n = 35, ♀ = 28 and ♂ = 7), and it would be difficult to describe a system for the recovery of a 28 chromosome hybrid, unless 2 sets of chromosomes were lost. Since Crépin, most authors have agreed that *R. gallica* was one of the parents of *R. damascena*. However, Naves and Mazuyer (1947) proposed that *R. gallica* was derived from a cross between *R. damascena* brought to France from the east and a local variety. The wide distribution of *R. gallica* (Fig. 1) makes this theory highly unlikely, but it is possible that some genetic exchange took place if *R. damascena* was introduced into French rose culture.

C. C. Hurst (1941) presented an alternative to Crépin's explanation: "It is

evident therefore that the Damask Roses are all hybrids of *rubra* (=*gallica*) but that some are hybrids of *phoenicia* while others are hybrids of *moschata*." The *R. moschata* × *R. gallica* plants, he identified as *R.* × *bifera,* the autumn damask rose with remontant flowering. The other combination he thought to be the progenitor of *R. damascena. Rosa moschata* and *R. phoenicia* are both in section *Synstylae*; *R. phoenicia* is found wild around the eastern Mediterranean (Fig. 1) and *R. moschata* is native to Afghanistan, the Himalayas, and China (Boulenger, 1933). Thomas (1955) commented, "It always strikes me as strange that some hybrids inclining more towards *Rosa moschata* have not been found." Thomas also stated that the *Synstylae* are known to add fragrance to hybrids.

The lack of continuous intergradation may not be so strange after all since the present wild ranges of *R. gallica* and *R. moschata* do not overlap and since *R. damascena* has been grown for centuries within the range of *R. gallica*. In Turkey and the Balkans, much more crossing could take place with *R. gallica* and the genetic material originating with *R. moschata* would be diluted, except when intentionally selected.

The *Synstylae* are diploid and one might expect a triploid hybrid (perhaps sterile) or a fertile hexaploid as the result of crossing with a tetraploid like *R. gallica*. But this is not the case. The crossing of diploid and tetraploid roses has often led to tetraploid cultivars of importance and wide variety (Darlington, 1973; Wylie, 1954).

Before World War II, there had been considerable debate on the nature of polyploidy in *Rosa*. Täckholm (1922) and Boulenger (1936) felt that the first roses were of high ploidy, octaploids or decaploids, and that more advanced roses had a tendency to lose chromosome sets. If one relates this theory to the similar tetraploids of the section *Rosa,* one could have them all arise by reduction of a common ancestor of higher ploidy. Erlanson (1938) disputed this, saying, "this hypothesis is contrary to the established cytological principle that polyploidy is a secondary and derived condition." Her argument included the 3 related primitive diploid genera, *Hesperhodos, Platyrhodon,* and *Hulthemia,* which some consider to be subgenera of *Rosa,* and cytogenetic and phytogeographic evidence that has put the matter to rest.

Phytogeography and human selection

How does human interference fit into an evolutionary scheme for *Rosa damascena?* This species has not been collected in the wild. Boissier (1872) was the first to note that it was not found spontaneously in Asia, and more recent florae concur (Hegi, 1923; Komarov, 1940; Nilsson, 1972). But the techniques of rose culture were well established by the rise of Ancient Greece, and roses were highly prized. If a chance hybrid possessing the scent and the aesthetic qualities of *R. damascena* were then found, the plant could have been perpetuated. Theophrastus, in *Enquiry into Plants,* Section VI, vi. 4, wrote of the Philippians who transplanted the many-petalled roses that they found growing on Mount Pangeus. If rose clones spread by human hands, we could expect a variety of hybrids between the introduced types and local wild species.

But there is the more basic question of the initial factors that influenced the domestication of all roses. As opposed to many other crop domestications, the

forces of uniformity do not win over individuality. As with corn in Mexico (Wilkes, 1970), roses have been chosen for their variety and special qualities; and only vegetative reproduction can act as the barrier to diversity caused by outbreeding and a general lack of genetic barriers to recombination.

If roses were initially selected for their fruit, the effects are not now apparent. Rose fruits have not been mentioned in any detail by the ancients as a food source, although locally they may have been of importance. If roses were chosen for their medicinal qualities, one might expect to find rose cultivars with special medicinal attributes; but excepting the rose of Provins, *R. gallica* f. *officinalis*, and the attar producing cultivars, that is not the case. Of course many medicinal plants have not been used on a scale which would encourage their domestication. Although many medicinal plants have been cultivated, most have been collected from the wild and continue to be so gathered (Isaac, 1970).

However, if roses were chosen for aesthetic qualities, especially flower form and color, and secondarily for lack of thorniness, then the plants so cultivated and selected would soon not be able to survive as wild things. Fewer thorns could decrease the rose's protection from grazing animals. And the choice of double flowers might decrease fertility, as could the choice of heterotic interspecific hybrids.

After a society is established enough to provide its basic needs, decorative materials assume importance. Through the example of the lotus in Ancient Egypt (Joret, 1894), one can see how a plant can truly provide decorative inspiration. (For a different perspective on possible reasons for the use of the lotus motif in Egyptian art, consult Emboden (1978).) Even if few depictions of roses are found in the archaeologic record of a region, one cannot eliminate the possibility that archaeologists may just be searching in the wrong places, for the rose is too beautiful to be wasted.

It is probable that *Rosa damascena* resulted from the interaction between conscious selection and the opportunity for the movement and recombination of many roses in the eastern Mediterranean region. In the above section on taxonomy and genetics, various theories about the origin of *R. damascena* were presented. C. C. Hurst (1941) outlined a theory most in accord with the weight of the evidence. *Rosa gallica* and *R. phoenicia* have overlapping ranges in the coastal regions of Turkey (Fig. 1) (Boulenger, 1932, 1933, 1936; Post, 1932; Nilsson, 1972; Komarov, 1940; Mas-Guindal and Mas-Guindal, 1944; Josifović, 1972). The 2 species there are allopatric (Nilsson, 1972), but human intervention or other chance events could overcome edaphic barriers. *Rosa gallica* is extremely polymorphic (Boulenger, 1936), and it has already been implicated in the parentage of a hybrid similar to *R. damascena*, *R.* × *Richardii* (Rehder, 1940). It is possible that by crossing the range of *R. gallica* types to *R. phoenicia*, progeny similar to *R. damascena* could be recovered. Of course that would be no final proof, only evidence, because the original parents of the plants which gave rise to *R. damascena* are long lost to the vagaries of time.

Perhaps chemotaxonomic research could lend greater insight into the parentage of *R. damascena*. Its essential oils are well characterized (Garnero et al., 1976; Naves and Mazuyer, 1947; Tschirch, 1917). For a comprehensive bibliography of works describing these chemical components, read the report of Garnero (1976). The chemical technology has reached a point where only a single blossom

is needed for determining the oil composition (Balinova-Tsvetkova et al., 1974). Even if most concern so far has been for yield and quality of product, the same techniques could be used to analyze the oils of rose flowers as a chemotaxonomic and possible phylogenetic tool. The use of compounds, such as those occuring in attar, for such a purpose has been attempted with varying degrees of success in *Salvia* (Emboden and Lewis, 1967), *Ambrosia* (Payne et al., 1972), and *Cupressus* (Zavarin et al., 1971).

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Roses in the Middle Ages[1]

MIA TOUW[2]

Though we now tend to consider roses only as subjects for horticulture and perfumery, there were times when their significance extended far beyond that. Their religious symbolism among the Christian Europeans merits a section to itself; and the section on their practical significance in medicine occupies almost half of the present article. Yet it is not because roses were less important in perfumery and horticulture that the latter two are eclipsed in this way, but only because they were so much more important in areas where they are now forgotten.

HISTORICAL BACKGROUND

Roses reached the height of European favor in the 1200s and the 1300s after several centuries of increasing popularity. At first, however, the severe asceticism of some early Christians, notably St. Clement of Alexandria, caused the use of flowers and perfumes generally to be denounced as abhorrent. Roses and lilies were considered special culprits (Gordon, 1953). This was a natural reaction to the significance of roses for their near neighbors and mortal enemies, the Romans. Roses and rose water were a major sign of luxury, and as such were indispensable on occasions of conspicuous consumption. Not only were there whole fountains of rose water, and not only would the floors sometimes be carpeted knee-deep with rose petals, but guests at banquets would have rose petals thrown over them. At a banquet given by Nero this rain of rose petals reached such proportions that several of the noble guests suffocated under the mass of flowers (Krüssmann, 1977).

The Romans learned to love the rose after their contact with the Persians and the Middle East, though they expressed their feelings in their own characteristically extravagant way. Similarly, hundreds of years later, the returning Crusaders would bring back to Europe a heightened appreciation of the rose. An understanding of the rose in the Middle East is necessary to understanding the influences which shaped European use of and thoughts about roses. Always favorites, they had been cultivated in western Asia and northeastern Africa 5,000 yr ago (Lehner and Lehner, 1960). There were roses in the gardens of Semiramis, queen of Assyria (Lehner and Lehner, 1960). The Zoroastrian text *Bundehesh* speaks of both a "hundred-petalled" rose and a "dog" rose, and mentions that the rose acquired thorns only when evil appeared in the world (Joret, 1892), an idea which would be repeated in European stories millenia later.

In a legend common among the Turks and the Persians, roses were said to be born of drops of Mohammed's sweat (Joret, 1892), a story which was both a cause and effect of roses' increasing popularity. There are legends that the rose took the place of the lotus as the queen of flowers in the Near East, an indication

[1] Received 26 August 1980; accepted 28 March 1981.
[2] Arnold Arboretum, Harvard University, 22 Divinity Ave., Cambridge, MA 02138.

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of its importance there after Islam became prevalent (Joret, 1892). In the Near East roses became a symbol of faithfulness and constant affection extending even after death. Numberless poets compared their beloveds to roses. Saadi, a Persian poet, called his famous compilation of moral and religious poems the *Gulistan* or "rose garden," to imply the pleasure and insight they would bring to the reader (Eastwick, 1974). In Moslem countries the flower came to be considered so holy that a mosque desecrated by nonbelievers could only be cleansed by being washed (entirely!) with rose water (Gordon, 1953).

To supply the great demand for roses and their products, an extensive industry developed in Persia which was at its height during the centuries between 900 and 1600 A.D. (Guenther, 1952). Ibn Khaldun, a Persian of the 800s, quotes a tax account showing that Fars had to pay Baghdad 30,000 flasks of rose water (in addition to 27,000,000 dirhams and 20,000 lb of black raisins) to satisfy the taxes (de Slane, 1862). Istakri, his contemporary, reported that the rose water of Fars was the best in the world and was exported as far as Spain and China (Mordmann, 1845).

The rose industry spread from Persia to the surrounding countries, among them Arabia. The Arabs perfected the art of distillation and were therefore able to make new products (Joret, 1892), among them attar of roses, and to produce larger quantities of good quality rose water. Especially the latter (because there was more of it) was extensively traded by the Arabs and was introduced to Christian Europe as early as the second half of the tenth century (Joret, 1892).

The rose products mentioned in various accounts do not always mean the same thing, though they may go by the same name. The rose water of the Romans was made simply by soaking petals in water, but after the invention of distillation it meant the distillate which results when roses are boiled in water. Similarly, early references to rose oil involve oil, usually olive oil, in which rose petals have been soaked a long time (e.g., Hort, 1916). True attar of roses, however, is the essential oil which separates from the distillate; sometimes this too is called rose oil.

The date when this essential oil was first discovered is a subject of debate. In the last century, literary references to attar prior to 1600 had not been found, and therefore it was thought that it had been invented around that time. The reference in question here was Mohammed Achem's account of Sultan Jehangir's wedding, which took place in 1643 (Parry, 1925; Gordon, 1953). The canals in the palace gardens had been filled with rose water for the occasion and his queen noticed a thin, oily and highly aromatic film on the water, which arose "due to the heat of the sun on the roses." She ordered it collected and named it "atr-i-Jehangiri" (Guenther, 1952; Lehner and Lehner, 1960). There is a flaw in this story which indicates that the process of making rose oil by distillation was known to Mohammed Achem and that therefore his account of the queen's "discovery" is more polite than true. The flaw is that heat would not only drive the oil out of the rose petals, but would also keep it in solution in the water; cooling would be necessary to allow the oil to separate out. The oily film could have arisen only at dawn after a cool night preceded by a hot day, but the author does not seem to specify these conditions.

More recent research has unearthed a far older reference to what was probably rose attar in Harib's chronicle of 961 written at Cordova (Guenther, 1952). It

seems likely that the Arabs, who were enthusiastic alchemists—distillation was, to my knowledge, central even to early alchemy—should be the first to discover the oil as a by-product of their researches. That Charlemagne's court received attar from Baghdad (Krüssmann, 1980) is evidence of how quickly the Arabs' discovery became an important article of trade. Avicenna, of the late 900s, is credited by some with being the original discoverer (Thompson, 1927; Gordon, 1953). Other candidates, who also lived somewhat too late to qualify, are Rhazes, who lived between the ninth and tenth century, and Aben-Zohar of Seville (Gordon, 1953). Attar of roses was independently discovered by Geronimo Rossi of Ravenna in 1574. In *De Distillatione Liber,* published in 1582, he reports that he noticed an extremely odorous oil rising to the surface of rose water under the proper conditions (Parry, 1925; Gordon, 1953).

Other rose products which became important in the Middle Ages, though they were usually only used medicinally, were rose honey, rose syrups, and eventually rose sugar. The honey and sugar were prepared simply by mixing in rose petals and allowing them to stand. The syrups would sometimes be boiled with rose petals (Joret, 1892).

It is not always clear, at this distance of time, exactly which roses were being used, either in ancient Rome or in medieval Persia or Europe. According to Parry (1925), Pliny apparently described *Rosa gallica* L., *R. centifolia* L., *R. damascena* Mill., *R. provincialis* [Herrm.] (=*R. gallica* L.), *R. moschata* [Herrm.], and *R. rubiginosa* [L.]. But Krüssman (1977) mentions only *R. gallica* and *R. damascena,* and he furthermore notes that the epithet "hundred-leaved" cannot be assumed to refer to *R. centifolia* L.; he considers it more likely to have been a highly double flowered *R. gallica* (Krüssmann, 1980). Guenther (1952) mentions that *R. damascena* is probably a hybrid between *R. gallica* and *R. canina* L., which would imply that *R. canina* existed in gardens as well in Pliny's time. However, the Caninae are the only section of the rose genus which show heterogamic meiosis; hybridization with one of the Gallicanae is therefore unlikely (Rowley, 1967). Darlington (1963) considers *R. moschata* Herrm. to be the other parent of *R. damascena.*

By the time of Macer Floridus (approximately 1000 A.D.), the species named were reduced to "rosa centifolia" and *R. canina* L. and a "wild rose" (Frisk, 1949). Meyer (1855) records a yet glummer situation in which even the name of the easily identified *R. canina* is misapplied. Quintus Serenus Samonicus mentions a "rosa" and Marcellus Empiricus writes about a "rosa sylvatica" (Meyer, 1855). Around 1100 a popular, so-called gothic, version of Dioscorides' herbal appeared (which was eventualy printed at Colle in 1478). In a chapter which is so highly changed from the original that it is difficult to tell which original chapter it refers to, *R. canina* is mentioned (Fischer, 1929). Dioscorides himself apparently mentioned only "rosa lutea" by name (Gunther, 1959). Fischer (1929) reduces the numerous rose names he found in his extensive review of medieval botanical literature to 6 species: *R. canina* L., *R. arvensis* L., *R. rubiginosa* L., *R. centifolia* L., *R. alba* [L.], and *R. villosa* [L.]. The numerous synonyms he gives for the first 4 species are listed below, partly to show just how numerous they are, partly to help other wanderers in the mazes of medieval German botanical literature.

Rosa canina L.	*R. arvensis* L.	*R. rubiginosa* L.	*R. centifolia* L.
rosa	rosa campestris	bedegar	rosarius
tribulus		rosa bedegar	rosa alba
rosa canina		wichhagenrosen	wyss rosen
zizisa		egelentyerrosen	edel rosen
rosa agrestis			gefullt rosen
rosa sylvestris			zam rosen
antera (anthera)			
cinosbato			
iuiube			
hyffa			
hagen			
hifaldra			
wildirosa			
veltrosen			
buttenrosen			
wichhagenrosen			

By Parkinson's time, around 1600, the number of rose species had reached and surpassed that of the Romans. Parkinson (1629) describes 24 different "species," many of them separated only on the basis of coloration. Some of the species he mentions are: rosa damascena, rosa cinnamomea, rosa moschata, rosa sempervirens, rosa provincialis, rosa sine spinis multiplex, rosa holoserica, rosa pomifera maior, and eglanteria duplex. As one can see, some of the increase in number is caused by excessive splitting of taxa; but on the other hand, some of the increase may be real, greater gardening skill allowing new hybridizations and the introduction of new species from the East or from the wild. Thus "rosa cinnamomea" may be the same as the currently valid species of that name (*R. cinnamomea* L.) yet it is not mentioned in earlier references.

ROSES IN EARLY HORTICULTURE

The cultivation of roses, which had been extensive in Roman times, was neglected for a few centuries after the fall of Rome. The only people with the leisure and sensibility to grow roses were monks and nuns, but that was the time of Christian revulsion against roses and all things Roman (Joret, 1892). Pre-Christian Germanic people planted wild roses near graves and as hedges around holy places (Ranke, 1951), but garden roses were unknown.

The Benedictines were the first to take the concept of gardens, as we know them, across the Alps. In the 700s garden roses were growing in southern France, probably in the form of hedges (Fischer, 1929). The future of rose gardening was assured, however, by Charlemagne's edict of the late 700s which prominently included roses in the plans for Crown land gardens (Krüssmann, 1980). The influence of this plan was very great and caused rose cultivation to spread rapidly (Fischer, 1929). In 840, the garden plan of St. Gallen's monastery showed roses bordering the "Herbarius" together with lilies (Fischer, 1929). The preservation and expansion of these garden varieties was carried on by monastery and convent gardens from whence they spread to castle gardens and gradually to other, humbler, secular gardens.

Though all flowering plants were grown for their practical value, often for medicine, roses and lilies were also grown simply for beauty and to decorate the

altar on certain festivals (Joret, 1892). Around 1200, Albertus Magnus included roses in his plan of the ideal pleasure garden. There would be a perfect lawn with shade trees on the south side, a wall to the west to keep out stormy winds, many flowers, among them roses, on the north side, and a beautiful spring or fountain in the middle (Albertus, 1867). By this time, rose cultivation had spread to Danish convents and monasteries (Joret, 1892). Poets, who had probably travelled and seen Italian rose gardens, have left behind some very early references to garden roses in Germany. However, since they are accompanied in these cases by such exotics as fig trees, one must assume that these references are poetic licence rather than botanical fact (Fischer, 1929).

RELIGIOUS SYMBOLISM OF ROSES

The religious significance which roses gradually acquired probably accounts for their eventual unparalleled popularity. Though we are now better acquainted with the originally Eastern love symbolism of the rose, the pre-Christian Germans associated it with the soul and with death (Ranke, n.d.). The flower was also sacred to Freya, goddess of love (Joret, 1892). In other words, the foundation for its acceptance as a Christian religious symbol was already present. Perhaps this foundation was an important factor in the evolution of the rose's religious significance, because it is a fact that the Bible does not speak of it that way. Moldenke and Moldenke (1952) show that "roses" in the Bible often refer to other beautiful but nonrosaceous flowers. In any case, whenever they are mentioned, only their beauty and decorative value are stressed; they are not spoken of symbolically (nor are they used medicinally).

Rose symbolism goes back to the earliest Christians. The ones to whom it meant worldliness and sensuality, though originally numerous, finally lost to those who saw the rose differently. St. Cyprian, who was martyred in 258, and St. Jerome, who lived around 400, praised roses and named them as one of the rewards that martyrs would find in Heaven (Joret, 1892; Gordon, 1953). Saint Benedict, scarcely a hundred years after St. Jerome, saw in roses only a means of "mortifying his flesh" whenever he felt "the world" drawing him back: a use of roses, or rather of their thorns, which is also reported for St. Francis of Assisi (Gordon, 1953).

As early as the first century, red roses were said to spring from the blood of martyrs (Gordon, 1953), and in 840, Walahfried Strabo wrote that the death of Jesus gave the rose its color. "Roses for war, for peace the lily," said Walahfried (Payne, 1966). To Saint Bernard (1091–1153), the rose not only symbolized the sufferings of Christ, but also Mary, white roses symbolizing her virginity and red ones her compassion (Joret, 1892). (Eve was a thorn in this scheme of things.) Thus, by a slow process, roses came to mean divine love to the Christians, and through symbolizing Christ's sufferings came to symbolize Christ Himself as well.

The miracles in which roses played a part are uncounted. An oft-repeated class of rose miracles involves food being surreptitiously carried to the poor which is changed into roses when the "culprit" is apprehended by hostile observers. The most famous of these was experienced by St. Elizabeth of Hungary. She was the exceedingly charitable queen of Louis, King of Thuringia, who was her childhood sweetheart. While he was away on a crusade, famine swept the country, and on

returning he heard embittered tales from his relatives how Elizabeth had created shortages at the palace by feeding certain of the poor. Louis believed the tales and forbade his wife to continue her charitable deeds. Nonetheless she continued to do so secretly, until one day he caught her with a basket full of food. On uncovering it, however, it proved to contain only perfect white roses which, since it was wintertime, was rightly construed as a miracle. Even her enemies were converted.

Joret, to whom I am indebted for the above account, also records a miracle explaining the origin of the rosary. A young monk, who was not generally hard-working, was unfailing in his devotions to the Virgin Mary. Once he was in a forest when it came time to say his prayers to Her. Unbeknownst to himself he had been surrounded by robbers. Once he started praying, Mary appeared, which caused the robbers to stop and only look on while she took 150 roses from his praying lips and worked them into a garland. The roses shrank as she worked them, and when they resembled beads she placed the garland on the monk's neck and disappeared (as did the robbers, in a more mundane way).

As a tangible expression of divine love, roses were often included in paintings of saints to show the divine love expressed in their lives (Gordon, 1953). There is an old pentecostal custom in Rome, probably going back to the time of Saint Gregory, who was pope between 590—604, of strewing roses down on the congregation from the top of the church to symbolize the coming of the Holy Ghost (Cornides, 1967). The custom spread to France and Spain as well, so that Pentecost is sometimes called "rose Easter" (Joret, 1892). Paradise, as a place replete with divine love, came to be called a rose garden, a theme which the minnesänger helped to popularize (Joret, 1892). The rose symbolism of Christ was also expanded. While red roses signified His sufferings, as before, the kingly yellow color denoted his majesty after the resurrection, the latter being expressed in the fragrance of the flowers (Cornides, 1967).

A golden rose was also used to show papal approbation, no doubt on the grounds that it was the closest earthly equivalent to divine love. The origins of the golden rose ceremony are obscure, but in its mature form it consisted of the bestowal of a rose of gold on the fourth Sunday after Lent by the pope to a person or group conspicuous for loyalty to the Church (Cornides, 1967). The first record of the ceremony is a papal bull of Leo IX in 1049 who required a golden rose or the equivalent weight in gold from the Heiligenkreuz monastery in Alsace-Lorraine. He refers to earlier ceremonies using the golden rose, so he is not the originator of the custom (Cornides, 1967). The first record of the ceremony as such dates from 1096 when Pope Urban II gave a golden rose to the Count of Anjou (Cornides, 1967). The recipients were usually temporally powerful, and quite mundane considerations would influence the choice of the "loyal" recipient.

In his very thorough scholarly work on the subject, Cornides lists 2 possible origins for the ceremony. It may have grown out of a custom, whose very existence is uncertain, commemorating Maria Magdalen's use of costly fragrant oil for Jesus's feet. During that ceremony the pope would give alms of fragrant spices. A further circumstance makes this ceremony a possible ancestor: Cornides does not seem to mention it, but Gordon (1953) tells us that in the earlier form of the ceremony the golden branch carried more than one 5-petalled rose, the topmost one being filled with balsam and musk. On the other hand, "rose

Sunday,'' as it is sometimes called, shows definite similarities to the orthodox mass centered on the cross given on the same Sunday. Both ceremonies are performed to intimate approaching Easter and to remind the faithful to look beyond fasting and penitence. Lent's penitential purple draperies and vestments are changed to rose color for this one Sunday to indicate the coming splendor of the risen Christ. Cornides favors this origin, which only involves a substitution of the rose for the cross as a symbol of Christ, over the rather obscure Magdalen custom.

Dante made probably the best-known use of the rose as a Christian symbol. Though in the thirtieth canto of *Paradise* the eternal rose is golden, and in the thirty-first it is whiter than snow, the image remains one of the whole of Heaven as an infinite eternal rose, whose petals are souls and whose fragrance is the never-ending praise of God (Sayers and Reynolds, 1964). In using this symbol, Dante seems to have given the highest expression to a rose symbol that was current during the 1200s and 1300s.

The rose as Christ went through one final permutation as a symbol for the Rosicrucians and the alchemists. The crucified rose became the sign of the Rosicrucians, while the alchemists took the metaphor even further and spoke of the resurrection of the rose. ''[A]ll material being placed in a glass vessel, with a certain quantity of pure dew, forms a blue powder, from which, when heat is applied, there springs a stem, leaves and flowers, and a whole and perfect plant is formed from its own ashes'' (Rosenberg fide Gordon, 1953). The alchemists considered the process of transmuting base metals to gold as an allegory of the soul's passage from worldliness to becoming a Son of God, so it is unlikely that the above quotation was ever meant as more than a metaphor.

THE ROSE IN LOVE, HERALDRY AND MAGIC

The secular symbolism of the rose is not entirely contained in its association with love and beauty. The Germanic peoples had originally associated it with death, the Christians with religious feelings. It was only after contact with the Orient that the rose came to mean worldly love in Europe (Ranke, n.d.), but the relatively late beginning did not stop it from becoming a widespread meaning in a short time. The major medieval love poem was named the Romance of the Rose, not of the violet or the lily. In Chaucer's rendering of it, he describes a beautiful maiden in the garden of love who

> So worthy is beloued to be,
> That well she ought, of prise and right,
> Be cleped Rose of every wight.
>
> (Sutherland, 1967).

The god of love in that garden is, furthermore, crowned with roses (Sutherland, 1967). In ancient Greece, Eros is supposed to have bribed the god of silence with a rose to persuade him to preserve silence on the affairs of the gods. Thus the rose became an emblem of secrecy and would be attached to the ceiling of council chambers to indicate that all present were *sub rosa,* or sworn to secrecy (Lehner and Lehner, 1960). Krüssmann (1977) gives a more mundane origin for this term: Greek army leaders, conferring in a rose bower, planned a surprise attack on

their Persian enemies and the secret plan was concluded "under the rose," which denoted strict confidentiality ever after. The rose as a sculptured ceiling decoration persisted till the last century, though its significance there had been forgotten. Joret (1982) remarks that rose crowns were common at medieval festivities. At marriages, with an intertwining of their religious and secular significance, they denoted both the virginity and the loveliness of the bride. As with the papal golden rose, the rose chaplet will sometimes have been inappropriately bestowed.

The rose had several related meanings in heraldry. When King Edward III founded the Order of the Garter, or the Order of St. George as it is sometimes called, the knights were to wear roses as part of their full regalia on St. George's Day. That day is celebrated even now by wearing roses (Gordon, 1953). After the Wars of the Roses, it became an even more important heraldic flower in England. A rose in full bloom meant mercy and justice. One in full bloom with some of the petals still in bud at the center and surrounded by 5 points to indicate thorns, meant beauty and nobility acquired with difficulty. Of course, the rose's religious meanings secured it a place on the crests and seals of many popes (Gordon, 1953).

Possibly as a remnant of pre-Christian times, possibly because of its association with marytrs, red roses occurred in superstitions as a sign of approaching death, especially sudden death (Joret, 1892). On the other hand, because the blood of Christ was supposed to have touched red roses, witches and devils were thought to fear them (Gordon, 1953).

Roses were not extensively used in magic except as ingredients in love potions. For the latter, Persian women used rose water; colonial United States women made "rose tipple" by marinating rose petals in brandy (Hendrickson, 1974). Tristan and Isolde's love potion is thought to have contained roses (Gordon, 1953). In a work attributed to Albertus Magnus, but probably written by one of his students, the following, less benevolent potion, is recorded: rose seed plus mustard seed plus a weasel's foot, all powdered and put into a bag which was hung in a fruit tree, would stop the tree from bearing fruit (Best and Brightman, 1973). Burying beetles in roses would kill them (Best and Brightman, 1973).

PRACTICAL USES OF THE ROSE

Rose cosmetics suffered from the same break in tradition as did the other uses of the rose. Dioscorides left behind a rose pomander recipe consisting of 40 drams of fresh roses beginning to fade and before "they have taken any wet," 10 drams of Indian nard, and 6 drams of myrrh. These were to be "beaten small," made into little balls and dried in the shade. "The use of it is to be put about women's necks instead of necklaces, dulling the unsavourie smell of the sweat" (Gunther, 1959). It may be interesting to note that this process survives to our day. Linsley (1977) described a method of making a necklace which would retain fragrance for many years, by repeatedly grinding rose petals (in a meat grinder in this case) and then forming the mass into little balls and drying it. Galen used a full pound of rose oil in a cosmetic which was the ancestor of modern cold creams (Hendrickson, 1974).

After the fall of Rome, rose cosmetics languished until rose water was introduced by the returning Crusaders. Bathing in rose water became a thing to do,

and rose water finger bowls appeared at the meals of those with any pretensions to gentility (Joret, 1892). The importance of these finger bowls can only be grasped when one considers that forks were not known in England until the reign of James I, and were then considered a "great piece of foppery" (Rimmel, 1865). Even refinements like cleaning the mouth with rose water after meals arose (Joret, 1892).

The greatest practical importance of the rose was in medicine. According to Krüssmann (1980) it was *R. gallica* and *R. canina* that were the medicinal species. Generally speaking, the rose was used to allay fever, inflammation or pain, or to stop any kind of excessive flow, be it lachrymation or diarrhea or a hemorrhage. These effects were deduced from the cool and dry properties ascribed to the rose by the authorities of the Middle Ages, such as Dioscorides, Galen and Avicenna. Dioscorides said that rose flowers cool and bind (i.e., stop flow), but that those which are dried bind more. Sprinkled on the gums, they stopped bleeding; made into a tea, they stopped diarrhea and the spitting of blood. Pounded fresh rose leaves made eye salves, while wine in which rose leaves had been soaked was applied as a wash for headaches and for troubles of the eyes, ears, gums, as well as of the rectum and vulva. Inflammations, including erysipelas and wounds, were treated with rose wine compresses (Gunther, 1959).

Theophrastus (Hort, 1916) gives an interesting clue to the possible reason why roses are considered to help ear pain. The Greeks used salt in the manufacture of rose perfume and by being warm and dry—or as we would say, somewhat antiseptic—it reduced the inflammation. Possibly this was also the source of the unresolved confusion about whether roses were "warm" or "cool." In the *Hortus Sanitatis* (Meydenbach, 1511), for instance, we find both properties listed without any attempt to reconcile the contradiction. The pattern is repeated in many herbals, though the stress is always on the cooling qualities.

Galen's *Littiere ad Corisium*, whose substance must have originally been written in Greek, was translated from the Arabic to the Catalonian by Johannes Jacobus c. 1350, and was then translated into Latin by Pansier (1909–1933). Though one can be reasonably certain of the accuracy of the last translation, the first two might leave much to be desired. The *Letters* appears to be a compilation by an unknown Arab(s) of the works Galen wrote on eye disease (Pansier, 1909–1933). Galen includes roses in numerous compounds; in a section on simple general remedies for the eyes, they are included in 5 out of 15 medicines. In case of eye injuries, he advises the sufferer to wash the eyes " patiently" in rose water and to dissolve the medicinal powders in rose water. Ground fresh roses are to treat scabies on the eyelids. In one of the rare exceptions to the rule that roses treat acute conditions, Galen recommends that the stomach be cleansed with rose honey as part of the cure for "hardness and albedo" of the eyes (Pansier, 1909–1933) (a reference to the cataract which results from chronic glaucoma?).

Walahfried's words indicate that rose medicines were highly respected in the Dark Ages (though, unless the wild growing *R. canina* was being used, they could not have been widespread): "No man can say / No man remember, how many uses there are / For Oil of Roses as a cure for mankind's ailments" (Payne, 1966).

The influential herbal of Apuleius Barbarus (also know as Pseudo-Apuleius and Apulei Platonici) written in 500 or 600 A.D. and of uncertain authorship despite the name given to it, listed many uses for a plant called "Rubus" with "cynos-

batos'' given as a synonym. The accompanying illustration is not sufficiently clear to determine whether he meant a relative of the blackberry or *R. canina*. The number of uses listed in the copy I consulted (c. 1483) was unusual for a 7th century work and possibly some of them were interpolated later. ''Rubus'' was to be employed for ear pain, hemorrhoids, leucorrhea, heart trouble, recent wounds, inflammation of the gums and lips, and for condylomata; all of which, except the last, require the cooling and calming qualities attributed to the rose. For the same reason, perhaps, Apuleius recommends the plant for the bite of ''serpent or man'' (Apuleius, ca. 1483).

Avicenna, in the very early 11th century, repeated the dictum that roses are cooling and drying (Opitz, 1939).

Constantinus Africanus had a great impact on European medicine. He was an Arab from Carthage who settled in Italy. There, around 1050, he was the first to make medical texts in Arabic accessible to Europeans by translating them into Latin. In the process he usually endowed these works with his own name. Thus his *Liber de Oculis* seems to actually be a translation of a work by Honein (809–873), who compiled it from Galenic texts (Pansier, 1909–1933). In this work the rose is said to be cooling and to dissolve hardened substances. It is also ''constrictive'' and prohibits the flow of ''humors,'' as occur literally in ophthalmia or eye injuries. For instance, for hordeolum (an inflammation of a sebaceous gland in the eyelid which feels much like a barleycorn) ''bedeguar'' mixed with ammonia dissolved in vinegar is applied. Rose powder or water or oil enter into several compounds for collyrium for sick eyes (Pansier, 1909–1933).

Macer Floridus from the late 1000s repeats the uses mentioned by Dioscorides, stressing that roses are especially good for the womb and for menorrhagia. He adds that the powder is good for mouth sours, as well as bleeding, and makes greater use of rose oil. Rose oil was drunk for uterine troubles, and rubbed on for headaches or itching. Held in the mouth, it alleviated toothache; and together with strong vinegar it was applied to wounds, burns or scalds. Constantinus Africanus is quoted as saying that the wild rose is hot and dry, while the garden rose (*R. centifolia*) is cold and dry in the first degree (Frisk, 1949).

Hildegard von Bingen, who lived at approximately the same time as Constantinus, recommends that roses be gathered at dawn and the petals then laid on the eyes to cure bloodshot eyes and make them clear. Belief in and use of the rose must have been spreading rapidly in the Germanic countries at this time, for she goes on to write that they are very good applied to ulcers and are a useful addition to ''any medicine or salve'' (Riethe, 1959). Fischer (1929) quotes her as saying that roses are also good for lung and liver pains, and that the fruits are good for stomach troubles.

Fischer (1929) has compiled a number of uses from early medieval Danish and German herbal glossaries and other texts. Taken all together, these works also follow Dioscorides, but they add the use of rose seeds for chest troubles and of rose leaves for lung troubles, they introduce the use of rose galls, and they record the use of the rose in cases of dizziness and neuralgia.

The *Circa Instans* was the standard pharmacological work from about 1200 until after the time of Paracelsus. It originated in Salerno, the medical capital of Europe at that time, but its actual authorship is unclear. It is usually attributed to a certain ''Platearius,'' more for the sake of convenience than scholarly pre-

cision (Damm, 1938). In this work the rose is discussed under "anthera" whereas "bedegar" seems to refer to a *Crataegus* (hawthorn) species. The uses, once again, largely follow those given by Dioscorides, though the estimate of its hemostyptic power has increased somewhat. It is said that rose tea will still the flow of blood once a tooth has been pulled out (Damm, 1938). Rufinus, in his herbal written in the late 1200s, says repeatedly that his source is the *Circa Instans,* though it is possible that he was trying to give some of his own statements more authority by that means.

Rufinus includes all the classical applications of rose medicines and recommends their use to counteract heartburn and vomiting due to "choler." He specifies that rose buds and dry roses are used in medicine, while mature ones are useless. He also says that rose oil made in a glass vessel heated in a water bath "bonum est," but rose oil cooked directly above a flame is not given this epithet. Dry roses strengthen the brain and the heart and restore the spirit. After this, he quotes "Alexander" in making a distinction between red roses, which are more strengthening than astringent, and white roses, which are astringent rather than strengthening (Thorndike, 1946).

De Vegetabilibus (c. 1250) is indisputably authored by Albertus Magnus, in strong contrast to the *Book of Secrets* attributed to him. It is largely devoted to strictly botanical information, but he does report the properties of the more important medicinal plants. Referring to Avicenna and Dioscorides and someone abbreviated as Plemp., he lists the following properties for *R. canina* L.: for infants a preparation of the seeds stops diarrhea due to "corruptions" which affect the motion of the muscles; a soup made of the juice calms toothache; the root stops bloody sputum, stops diarrhea due to a debilitated stomach, and opens obstructions; the rose is especially binding in stomachics; it is good against long phlegmatic fevers; chewed and placed on scorpion bites it attracts the venom; drinking a preparation of the seed helps against all bites of reptiles, and "helps for many other things" (p. 359). Speaking of the rose generally, he states that it is opening and sedates the tenesmus of cholera; and he concludes by saying (p. 448), loosely translated, "altogether it comforts the interior organs and does many other things, as determined by the medical men."

The general popularity of the rose eventually pushed it into the class of a wonder drug. Joret (1892) records the uses recommended by a certain Hagendorn who said it was good even for epilepsy, tuberculosis, goiter and gout, as well as all the more usual illnesses.

The very important herbal *Hortus Sanitatis,* originally compiled by Jacob Meydenbach in 1491, devotes 4 pages to the rose, in contrast to the paragraph or so given to most plants. It refers to Avicenna, Rhazes, Dioscorides, Macer, and Joannes Mesue. As always, roses are mainly cool and dry. The white ones are said to be cooler, the red ones drier, on the authority of Mesue. Avicenna is quoted as believing that they "comfort the heart." Liver and stomach diseases, even cholera, are within the rose's field of activity. The *Hortus* notes that it has the ability to penetrate into the most dense and deep parts of the body, which constitutes a major factor in its ability to heal (Meydenbach, 1511).

During epidemics and plagues, rose fragrance or incense was held to purify the air. In public places one created one's own private cloud by carrying or wearing pomanders and perfumes. For the very rich there was better protection in the

form of goa stones. Precious stones were ground up with enough rose water to make a paste and form a pellet. Once dried, this was then carried on one's person (Gordon, 1953).

Roses did not escape from the application of the Doctrine of Signatures, even though they had no lack of obvious uses. Gordon (1953) gives the following quotation from Paracelsus: "Flowers that are of a burning color like the rose are apt to heal inflammations; those which bear the color of a face heated by wine, as the rose does, obviate drunkenness."

Later herbals demonstrate the influence of the major medieval classics. *An Herbal* of 1525 is an almost perfect transcription (except that it is in English) of part of Rufinus' section on roses. Turner, in 1548, says that they are cold and dry in the first degree. Gerard uses both rose water and crushed leaves gently heated with sugar for all that requires a gentle cooling, for eye pain, and to bring sleep (Woodward, 1964). Parkinson remarks that "the Rose is of exceeding great vse with vs." He differentiates among the uses of damask, red, and white roses, but taken together they still exemplify the medieval tradition (Parkinson, 1629).

A final, and seemingly fanciful, use of roses involved the payment of fines and rents with the flowers. However, when the landlord required a rose at Christmas and a snowball at Midsummer, this amounted to a tenancy terminable at will (Gordon, 1953). In 1379, one freshly picked rose per year was the fine levied for a minor building violation. To this day the Lord Mayor of London is presented with one red rose as the yearly installment on the original fine (Gordon, 1953). In a serious vein, the Bishop of Ely in England leased Ely Place in 1576 for 10 loads of hay, 20 bushels of roses, and 1 red rose to be paid yearly at Midsummer (Gordon, 1953).

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For 15 years Drs. Järva and Parmasto and numerous of their colleagues collaborated in producing the first complete list of fungi (3,277 species) known to occur in Estonia. The record covers a 200-year period from 1777 to the present. The data appear in two parts: (1) a taxonomic section alphabetically records the genus and species of fungus, followed by references in the literature to its occurrence and to other pertinent data concerning it, and (2) a host index with appropriate literature citations. Introductory remarks are in Estonian, Russian, and English. The bibliography has 1,192 entries. This compendium should serve as an important guide for the phytopathologist who has a need for these significant data from the Estonian S.S.R.

B. Lowy, Louisiana State University, Baton Rouge, LA 70803

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ONYCHA, INGREDIENT OF THE ANCIENT JEWISH INCENSE: AN ATTEMPT AT IDENTIFICATION

HAROLD J. ABRAHAMS[1]

The composition of the ancient holy incense is given to us in Exodus *30:34/5* of the Jewish Publication Society Bible as follows: "And the Lord said to Moses: Take unto thee sweet spices, stacte, and onycha, and galbanum; these sweet spices with pure frankincense, of each there shall be a like weight. And thou shalt make of it incense, a perfume, after the art of the perfumer, seasoned with salt, pure and holy."

With rare exceptions, spices and components of incense are of vegetable origin. With regard to the Tabernacle incense, most scholars agree that the term "stacte" is of Latin and Greek origin, and that stacte represents myrrh, the oleoresin from various species of *Commiphora* trees, indigenous to northwest Africa and Arabia. Myrrh occurs as yellowish to reddish-brown tears, with vanilla-like odor. The French Bible expert Rashi (acronym for Rabbi Solomon ben Isaac, 1045–1105), whom the German theologian Johann Buxtorf (1564–1629), himself a leading commentator on Bible and Talmud, called "*consummatissimus ille theologiae judaicae doctor,*" equates "stacte" with the Hebrew "nataph," meaning to drip. This meaning is identical with that of the Latin "stacte" and the Greek derivation "stacté," all suggesting the bleeding of the substance from the tree.

Galbanum consists of the gum-resin contained in the roots of *Ferula galbaniflua* and related *Ferula* species, large, stout perennial umbelliferous plants with interlacing leaves. Commercial galbanum supplies come primarily from the Levant, and occasionally from Iran. Galbanum occurs as friable masses of loosely agglomerated tears, yellowish to brown, with a somewhat terebinthinate odor.

Frankincense, commercially known as olibanum, is a sweet-smelling, balsam-like oleoresin, obtained from several *Boswellia* species, small trees, growing in Nubia, Egypt, Arabia, and Somaliland. Olibanum appears as yellowish-brown tears, with a sweetish, balsamic odor. Common names are male incense and gum thus. Nowadays the resin is used mainly in incense formulations and in perfumery. The German "Weihrauch" means sacred incense. The same meaning is expressed by frankincense, though somewhat less precisely.

We turn now to onycha, the remaining fourth ingredient. Its identity is as uncertain as it is controversial. The author of this paper offers his conclusions, based upon a lifetime study of the Bible and of the plants and plant derivatives which are contained in it.

Due to the fact that various Septuagint translations and interpretations appeared in the third century B.C. in Palestine, later in Greece, and finally in Alexandria, the effort to identify onycha meets with "confusion worse confounded." Nowadays the most universally accepted definition of onycha is that it was obtained from the claw-like operculum, or from the shell of a mollusk belonging to the genus *Strombus,* which is indigenous to the Red Sea. The Spanish Bible (1) refers to it as "uña," meaning claw. The French Bible (2) translates onycha as "l'ongle odorant," meaning fragrant claw. In the New World Translations (Watchtower Bible and Tract Society of Jehovah's Witnesses) the German Bible records onycha as "Raeucherklaue," identical in meaning with the above French "l'ongle odorant," while the French Bible of the New World Translations carries

[1] Place One Apt. 503, 777 W. Germantown Pike, Plymouth Meeting, PA 19462.
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onycha as "l'onyx," leaving it up to the reader to choose between mineral and plant. Most English Bibles support the mollusk interpretation, among them The Standard Edition of the Holy Bible, the Moffat Bible, The New English Bible, and the New Oxford Bible. The mollusk translation is also followed by 12 prominent American Bible Dictionaries and Encyclopedias which were consulted. According to The Interpreter's Dictionary of the Bible, a similar product is still being used in Upper Egypt for fumigation.

This wide-spread interpretation is based on the original Greek term "onyx" of the Septuagint. It means fingernail or animal claw. In this sense it is also a medical term, onycha meaning inflammation of the nail matrix. The term onyx relating to a fragrant substance is found in the Ecclesiasticus book *24:15* of the Apocrypha, where wisdom is being compared with the pleasant odor of galbanum, onyx, and storax.

It should be pointed out here that nail or claw is actually an extended connotation of onyx, derived from the translucent and sometimes veined appearance of the gemstone onyx, its familiar meaning.

The widely held mollusk hypothesis becomes quite perplexing if one considers that the mollusk was counted among the unclean animals in the Bible. Chapters Leviticus *11:9* and *12* of the Jewish Publication Society Bible read as follows: "These may ye eat of all that are in the waters: whatsoever hath fins and scales in the water, in the seas, and in the rivers, them may ye eat (*9*), and whatsoever hath no fins nor scales in the waters, that is a detestable thing unto you (*12*)."

It seems highly unlikely that the use of the mollusk or of parts of the mollusk was intended or permitted for rites in the Holy Tabernacle, and this is indeed confirmed by the famed theologian Nachmanides, who emphasized that the commandment concerning unclean animals pertained not only to dietary rules, but to the temple service as well.

Martin Luther must have had exactly the same view as Nachmanides. In Luther's Protestant Bible, translated from the Greek text of Erasmus (1466–1536), and published in 1534 as Die Heilige Schrift, he translates onycha into the German "Balsam," equivalent to the English balsam or balm, meaning an exudation from a plant, usually an oleoresin like Balsam Fir (Canada Balsam), Balsam Tolu, or Balm Gilead. With this Luther pointedly rejects the mollusk idea for onycha. Apparently unable or unwilling to be more specific, Luther nevertheless felt that onycha was a plant product.

It should be mentioned at this point that Luther in his momentous undertaking had the faithful cooperation, that is the counsel and wisdom, of Philipp Melanchton, German Reformer and Bible expert. Luther's co-worker was so immersed in his work and so enamored with the Greek language, that he Hellenized his German name of Schwarzert into Melanchton.

As already pointed out, onyx in its familiar and probably original meaning denotes a translucent gemstone, often with parallel bands of different color shades, best known as onyx marble or Mexican onyx. This mineral is valued in the making of cameos and in the crafting of ornamental objects. Some Biblical writers have used the term onyx for translating the Greek "onyx," leaving the true meaning uncertain: they include Winifred Walker, author of the excellent book "All the Plants of the Bible." The author of the Apocrypha chapter quoted above, however, left no doubt that he meant onyx as a fragrance. A far-fetched explanation for the use of the mineral onyx would be that in powdered form it could have acted as a filler in the incense mixture, in order to keep it from compacting. However, like the mollusk interpretation, this one also seems highly unlikely.

Onyx as a mineral is mentioned eight times in the books of Genesis and Exodus (3), not in connection with fragrances, but as one of the bases for engraving the names of the tribes of the Children of Israel, and, framed in gold, as decoration for the ephod and the breastplate of the high priest. In most instances the term onyx stone is used in these chapters. If a mineral had been implied in describing the incense formula, the Hebrew word would have been "Shuham" instead of "Shecheleth."

Pursuing our inquiry from the Hebrew terminology further, we again find disagreements among the Bible scholars. Shecheleth is to Rashi the root of an aromatic herb, while most others regard it as a nail or claw, as we have seen. One modern Hebrew dictionary (4) cites "Tzfrain" as a synonym for "Shecheleth," translating both as "kind of spice," but another Hebrew dictionary (5) identifies "Tzfrain" as nail or claw.

The Bible interpreter Bochart claims that onycha was benzoin, a gum-resin from *Styrax* species, particularly from *S. tokinense* of Siam and *S. benzoin* from Sumatra, both small shrubs or trees. Especially the Siam type has an agreeable vanilla-like odor. It is used in the manufacture of perfumes and in fumigating pastilles. Both types are also used medicinally as expectorants.

The use of benzoin in the Biblical incense is not altogether inconceivable: Syro-Arabian tribes maintained extensive trade routes prior to Hellenism, but it appears extremely doubtful that an alien substance could have been included in the instructions that were given to Moses for making the holy incense.

Bochart also mentions that onycha could possibly be bdellium. The bdellium interpretation, in turn, is again enigmatic and controversial. According to Winston's Dictionary the term derives from the Greek "Bdellion," which corresponds to the Hebrew "Dolkh," meaning a pearl, a carbuncle, or a crystal. Biblically, according to Winston, bdellium is an unidentified substance, but in Genesis *2:12* it is clearly a mineral, named together with gold and the onyx stone as the treasures of the land that God created. In Numbers *11:7* we read: "Now the manna was like coriander seed, and the appearance thereof as the appearance of bdellium." This leaves the definition once more open to doubt. In the botanical drug trade bdellium is known as the commonest and most important adulterant of myrrh. Botanically it represents a gum-resin from African species of *Balsamodendron* trees. *Balsamodendron,* in turn, is a synonym of *Commiphora,* the genus that yields myrrh. Bdellium itself is not important in the drug trade on its own merits, and by the same token it would hardly qualify as an ingredient in the Biblical incense.

During the centuries after Mohammed, at the height of Arab might and culture, most Jews lived under Arab domination and became Arabic-speaking. The renowned scholar and writer Saadya (882–942), born in Upper Egypt (Fayum) and educated in Fustat (Old Cairo), provided an Arabic translation of the Bible for his people in Arab lands. He was equally versed in Hebrew, in Greek, and in Arabic, and he knew the people and customs of the whole region intimately. Saadya's translation for Shecheleth was the Arabic "Ladana," and ladana is our ladanum or labdanum.

Over the centuries a flood of different Bible translations have surfaced, more than enough to verify the axiom "to translate is to traduce." As an example, the King James Version of Nahum *2:3* reads: "The shield of his mighty men is made red, the valiant men are in scarlet, the chariots shall be with flaming torches . . . . and the fir trees are terribly shaken." Fir trees appear in the Goodspeed translation as chargers, in the Moffat Bible as horses; Douay calls them drivers, and Jastrow translates Cypress spears. Please note that the Hebrew text for fir

trees translates as cypress spears. It is also interesting that writers of antiquity often spoke of spears as firs.

After diligent reflection on all these diverse opinions, there is little doubt in my mind that onycha of Exodus *30:34* is labdanum. Saadya's labdanum is not only ideally suited for use in incense, but it is also a product of the Jewish homeland (see Genesis *37:25* "behold, a caravan of Ishmaelites came from Gilead, with their camels bearing spicery and balm and ladanum, going to carry it down to Egypt."). It represents the resin from various species of the rockrose *Cistus creticus, C. ladaniferus,* and other *Cistus* species, all indigenous to the lands around the Mediterranean Sea. The material itself is collected by lashing the bushy *Cistus* plants with leather tongs, to which the resin adheres. Another collecting method is to remove the resin from the wool of sheep who roam through the *Cistus* bushes, or have been driven through them on purpose. The commercial article consists of dark-brown to blackish masses, with a gray fracture when fresh, or of cylindrical rolls, much like sticks of licorice, easily softened by the warmth of one's hand. Its odor, due to its essential-oil content, is very agreeable, balsamic, and distinctly pinaceous. Labdanum is insoluble in water, soluble in alcohol, fusible, and it burns with a bright flame. A reasonably pure sample contains approximately 85% resin and volatile oil, 5% wax, and up to 10% insoluble impurities. Since labdanum is a distinctly expensive article, adulterations are commonplace in today's drug trade. Solubility tests determine its quality. In years long past labdanum was used therapeutically against dropsy, dysentery, and chronic bronchitis; also as fumigant in rooms where patients were kept (6). For many centuries its main use has been for sachets, in perfumery, and in incense formulations.

When Sheele discovered chlorine in 1774, he was sure that he had found a new element, but he was unable to prove the point. He was sure, however, that his new substance was not a compound. Chlorine was eventually recognized as an element by Davy in 1810. *Mutato nomine,* like Martin Luther, I am sure that Shecheleth (onycha) is a plant product. More specifically, I feel, in a tentative way, that labdanum fills the bill most convincingly.

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Frankincense and Myrrh[1]

Arthur O. Tucker[2]

While frankincense and myrrh have been harvested from a multitude of species, certain species have predominated in history. Boswellia carteri *and* B. frereana *are the main sources of frankincense today, while* B. papyrifera *was the principal source of antiquity and* B. sacra *was the principal species of classical times.* Commiphora myrrha *is the chief source of myrrh today, but* C. erythraea *was the principal source of ancient and classical times. Each of these oleo-gum-resins has a characteristic odor that is predominately due to a mixture of complex sesquiterpenes.*

The gifts presented by the Magi to the infant Christ were of the greatest value of the time but also symbolized his life: gold for royalty, frankincense for divinity, and myrrh for suffering (Groom, 1981). Myrrh was also in the final drink offered to Christ on the Cross: "And they gave Him to drink wine mingled with myrrh; but he received it not" (Mark 15:23). Myrrh was, in addition, used to embalm the body of Christ: "And there came also Nicodemus, which at first came to Jesus by night, and brought a mixture of myrrh and aloes, about a hundred pound weight" (John 19:39).

The use of frankincense and myrrh was already ancient in the time of Christ, and even today frankincense is *the* incense and myrrh is still used (albeit to a very limited extent) in some medicines. Yet, we cannot be sure that the frankincense and myrrh of today are the same frankincense and myrrh of the time of Christ; the further back in time that we delve, the more unsure we become as to the correct identity.

We may ponder further attributes of frankincense and myrrh. What chemicals contribute to the smell of these 2 resins? How are frankincense and myrrh used today in fragrances and flavor? Do they have any real medicinal value? What are the active constituents, if any? Unfortunately, in attempting to resolve these questions, the superficial researcher may encounter many errors in the past literature that have been quoted and requoted, creating a vast confusion.

FRANKINCENSE

Frankincense, or olibanum, is a natural oleo-gum-resin composed of about 5–9% essential oil, 65–85% alcohol-soluble resins, and the remaining water-soluble gums. Frankincense is harvested in the form of tears or lumps from the size of a pea to that of a walnut. It is pale yellow or pale amber in color (Arctander, 1960; Guenther, 1950).

Frankincense is derived from species of the genus *Boswellia* of the Burseraceae. Inferior forms of frankincense come from *B. papyrifera* (Del.) Hochst., found in Ethiopia, Sudan, and East Africa; this is claimed to be the source of frankincense

[1] Received 17 August 1984; accepted 8 February 1986.

[2] Department of Agriculture and Natural Resources, Delaware State College, Dover, DE 19901-2275.

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of antiquity. The Arabian frankincense of classical times came from *B. sacra* Flückiger (*B. thurifera* sensu Carter). In Somalia, frankincense is collected today from the mohr madow tree (*B. carteri* Birdwood, the so-called Bible incense or olibanum) and the yigaar tree (*B. frereana* Birdwood, the African elemi, or elemi frankincense). Indian frankincense (Indian olibanum) is derived from *B. serrata* Roxb. ex Colebr. *Boswellia bhau-dajiana* Birdwood may also pass as frankincense (Abercrombie, 1985; Groom, 1981; Hepper, 1969; Miller, 1969; Uphof, 1968).

The principal frankincense species of today, *Boswellia carteri,* is native to Iran, Iraq, and Somalia (Uphof, 1968). *Boswellia sacra* is not as common today as it once was due to a history of gradual desiccation of Arabia, sharply reducing the vegetation over the last 2,000 yr (Groom, 1981). *Boswellia carteri* and *B. frereana* often grow attached to marble rocks and rock crevices in East Africa (Groom, 1981; Hepper, 1969; Howes, 1949). The main shipping ports are Djibouti, Aden, Mogadiscio, and Berbera (Arctander, 1960).

Boswellia carteri is a deciduous tree with alternate, pinnately compound leaves. The flowers are white or pale rose in axillary racemes. The bark is filled with schizogenous oleo-gum-resin reservoirs (Grieve, 1967; Groom, 1981; Guenther, 1950; Hepper, 1969; Moldenke, 1952; Walker, 1957).

The gum is obtained by scraping the bark and/or making deep, longitudinal incisions 4–8 cm long with a scalpel-like tool called a *mengaff.* The milky juice hardens on exposure to air into globular, pear-, or club-shaped tears. These are collected after 14 days and the wound refreshened. The desired consistency of the gum is attained about 3 mo later. Trees are rested every 5–6 yr. The season for gathering extends from late March to early April until September (for *B. carteri*) to December (for *B. frereana*) (Grieve, 1967; Hepper, 1969; Howes, 1949).

The word frankincense is derived from the Old French *franc encens,* meaning "pure incense" (Skeat, 1963), or, literally, "free lighting" (Walker, 1957).

The Arabic word for frankincense is *lūban,* derived from the Semitic root denoting whiteness and inferring purity. The Hebrew name is *lebōnā*; the Greek, *libanos* or *libanotos*; and the Latin, *tus* (Groom, 1981; Walker, 1957). The ancient Egyptian word was *neter-sent* (Klein-Rebour, 1963).

Frankincense (often designated simply as "incense" in the older literature) has had an ancient use in incense, embalming, and cosmetics (Dörr, 1973; Klein-Rebour, 1962, 1963, 1964). Frankincense is mentioned 22 times in the Bible; 16 times for religious worship, twice as a tribute of honor, once as an article of merchandise, and 3 times as a product of the royal garden of Solomon (Moldenke and Moldenke, 1952). While frankincense is included in the formulation of the holy incense handed down by God to Moses (Exodus 30:34; see also Leviticus 2:15 and 24:7), this passage does not provide historical evidence for the use of frankincense at the time of Moses because the Pentateuch was not accepted as divinely inspired and authorized until 450–350 B.C. (Trawick, 1970) and contains many such anachronisms (e.g., references to the camel in Genesis 12:16, but the camel was unknown as a domesticate in north Arabia much before 1200 B.C.). Furthermore, any frankincense in use at that time would have been an inferior form from *B. papyrifera.* Frankincense was included in the gifts from the Magi to the Christ child (Matthew 2:11), and the source may have been *B. sacra* (Groom, 1981).

Rough calculations based on Pliny suggest that the total production of frankin-

cense was 2,500–3,000 tons/yr (Groom, 1981). According to Herodotus, 1,000 talents (about 98,422 lb) of frankincense were offered each year during the feast of Bel in Babylon (Grieve, 1967). The *kohl,* or black powder, used by the ancient Egyptian women as an eye cosmetic was powdered galena (Adamson, 1969), often mixed with frankincense. Today an acceptable incense in Roman Catholic churches is composed of 1/15 storax, 4/15 benzoin, and 10/15 frankincense (Grieve, 1967).

The odor of frankincense is described as fresh-balsamic, dry and resinous, slightly green odor with a fruit topnote and a diffusive note of green, unripe apple peel. Frankincense is employed by perfumers as an absolute (by alcohol extraction), oil, or resinoid (by hydrocarbon extraction). It is used in the Oriental bases, ambres, "powder" perfumes, floral perfumes, citrus colognes, spice blends, violet perfumes, male fragrances, etc. It blends well with spice oils, labdanum, mimosa, neroli, muguet bases, woody notes, and other balsamic notes (Arctander, 1960).

Frankincense is included in the formulations of a number of modern perfumes, including: *Replique* by Colonia, *Me!* by Frances Denney, *Mennen Millionaire* by Mennen, *Nino Cerruti Pour Homme* by Uniperf, *Onna* by Gary Farn, *Sculptura* by Jovan, *Volcan d'Amour* by Diane von Furstenburg, *Paul Sebastian V.S.O.P.* by Sebastian, and *Gambler* by Jovan (Fragrance Foundation, 1983).

Frankincense was formerly considered as a stimulant and was once used to treat leprosy in China (Grieve, 1967).

The literature on the chemistry of frankincense is often confused as to the species of the parent material. The material from Eritrea seems to be *B. papyrifera,* while the material from Somalia and Aden is *B. carteri* (Hairfield et al., 1984).

Guenther (1950) summarized the previous literature on olibanum oil and reported the presence of: α-pinene, limonene, phellandrene, cadinene, camphene, *p*-cymene, borneol, verbenone, and verbenol. One of the first studies of olibanum resin isolated acetyl-α-boswellic acid and acetyl-β-boswellic acid (Winterstein and Stein, 1932). Corsano and Picconi (1962) isolated elemadienonic acid from frankincense. Corsano and Iavarone (1964) confirmed the presence of acetyl-α-boswellic acid and acetyl-β-boswellic acid and also isolated 3-acetyl-11-hydroxy-β-boswellic acid in frankincense. Snatzke and Vertésy (1967) isolated from frankincense: 11-keto-β-boswellic acid acetate, 3-*epi*-α-amyrin, 3-*epi*-β-amyrin, *epi*-3-α-amyrin acetate, *epi*-3-β-amyrin acetate, α-amyrenone, β-amyrenone, and viridiflorol. Yates and Wenninger (1970) identified 28 sesquiterpene hydrocarbons from olibanum oil: δ-elemene, α-cubebene, α-ylangene, α-copaene, β-bourbonene, α-gurjunene, β-elemene, *trans*-α-bergamotene, α-guaiene, β-copaene, β-ylangene, caryophyllene, thujopsene, aromadendrene, *allo*-aromadendrene, α-humulene, β-humulene, selina-4,11-diene, γ-muurolene, α-muurolene, β-selinene, α-selinene, δ-cadinene, γ-cadinene, cubenene, β_1-cadinene, calamenene, and α-calacorene.

Higazy et al. (1973, 1974) identified from extracts of olibanum from Arabia: 2.1% α-pinene, α-thujene, 3.1% β-pinene, 3.6% sabinene, limonene, 4.1% *p*-cymene, terpinolene, 1.2% α-phellandrene, 5.7% myrcene, 5.1% α-cubebene, 3.6% α-copaene, β-bourbonene, *trans*-α-bergamotene, 1.2% β-caryophyllene, *trans*-β-farnesene, 15.4% β-ylangene, 4.1% β-guaiene, 6.2% bornyl acetate, 6.9% *allo*-aromadendrene, 9.0% borneol, α-humulene, β-humulene, α-muurolene, 2.8% *trans*-pinocarveol, 0.6% terpinen-4-ol, α-selinene, β-selinene, *trans*-verbenol, γ-cadinene, δ-cadinene, 0.8% verbenone, 1.7% *p*-mentha-1,5-dien-7-ol, 0.9% ethyl laurate, and 1.9% farnesol. They also reported: β-phellandrene, terpinene, homomyrcene, β-cadinene, δ-guaiene (=α-bulnesene), farnesane, carvone, terpenyl acetate, and anisaldehyde.

The first studies of *B. carteri* isolated incensole (Corsano and Nicoletti, 1967), incensole oxide (Nicoletti and Forcellese, 1968), and isoincensole oxide (Forcellese et al., 1972). The first thorough analysis of frankincense identified as to source is that by Obermann (1977) and Klein and Obermann (1978, 1979). In the oil of the material from Eritrea, Klein and Obermann showed: 4.6% α-pinene, 1.1% camphene, 1.5% methoxytoluene and hexyl acetate, 5.8% limonene and 1,8-cineole, 8.0% n-octanol, 2.5% linalool, 52.0% octyl acetate, 1.0% bornyl acetate, 2.3% cembrene A, 2.4% incensole, and

3.4% incensole acetate. In the oil of the material from Aden, Klein and Obermann showed: 43.0% α-pinene, 2.0% camphene, 1.5% β-pinene, 1.0% sabinene, 0.5% *o*-cymene, 6.0% limonene, 1.0% 1,8-cineole, 7.5% *p*-cymene, 1.5% α-campholenic aldehyde, 6.5% verbenone, and 1.5% octyl acetate. Analysis of the terpene- and sesquiterpene-free olibanum oil from Aden revealed: 9.0% *trans*-pinocarveol, 8.0% terpinen-4-ol, 2.6% thymol + bornyl acetate, 3.0% δ-cadinol, and 4.3% incensole + diterpenoid.

Klein and Obermann (1978, 1979) and Obermann (1978) also isolated from the oil of the material from Eritrea: caproic acid, oenanthic acid, caprylic acid, pelargonic acid, and lauric acid. In the oil of the material from Aden, they isolated: α-boswellic acid, β-boswellic acid, α-campholenic acid, γ-campholenic acid, campholytic acid, geranic acid, lauric acid, myrthenic acid, *cis*-10-thujanic acid, *trans*-10-thujanic acid, and cembrenole. From the pyrolysate of the material from Aden, acetic acid, benzoic acid, n-butyric acid, cuminic acid, perillic acid, and n-valeric acid were identified. Pyrolysates of material from both Aden and Eritrea yielded: *o*-cresol, *p*-cresol, thymol, carvacrol, 4-isopropyl phenol, 2-methyl-6-allyl-phenol, lauric acid, myristic acid, palmitic acid, oleic acid, linoleic acid, linolenic acid, α-campholenic acid, myrthenic acid, geranic acid, *cis*-10-thujanic acid, *trans*-10-thujanic acid, perillic acid, 3-isopropylbenzoic acid, cuminic acid, acetic acid, butyric acid, isobutyric acid, n-valeric acid, acrylic acid, tiglic acid, 3-methyl-but-2-enoic acid, and benzoic acid.

Peyron et al. (1981, 1982) reported on frankincense oil and resinoid from Aden and Eritrea: α-thujene, α-pinene, camphene, β-pinene, sabinene, myrcene, α-terpinene, α-phellandrene, limonene, β-phellandrene, terpinolene, *p*-cymene, γ-terpinene, copaene, guaiene, caryophyllene, borneol, verbenone, and octyl acetate. In pyrolysates of the same material, they identified: furfural, methylfurfural, hydroxymethylfurfural, 2,4-pentanedione, acetyl-furan, phenol, *o*-cresol, *p*-cresol, guaiacol, 2,5-xylenol, 2,6-xylenol, trimethyl phenol, eugenol, thymol, methyl pyrazine, trimethyl pryazine, 2,5-dimethylpyrazine, 2,6-dimethylpyrazine, and (furyl-2)-2 pyrazine.

In pyrolysates of frankincense from Aden, Pailer et al. (1981a,b,c) reported: α-campholenic aldehyde, cuminaldehyde, carvotanacetone, phellandral, *o*-methylacetophenone, carvone, perillaldehyde, eucarvone, 1-acetyl-4-isopropenylcyclopentene, piperitone, nopinone, cryptone, verbenone, γ-campholenic aldehyde, thujone, myrthenic acid, Δ^4-*p*-menthen-3-one, 3,6,6-trimethylnorpinan-2-one, myrtenal, 2,4-dimethylacetophenone, pinocamphone or isopinocamphone, isopropylidenecyclohexane, α-amyrenone, 11-keto-α-amyrenone, 5-hydroxy-*p*-menth-6-en-2-one, 10-hydroxy-cadin-4-en-3-one, and 1,2,4-trihydroxy-*p*-menthane.

Proietti et al. (1981) examined the essential oil of *B. frereana* and identified lupeol and *epi*-lupeol. Strappaghetti et al. (1982) examined the essential oil of *B. frereana* and identified α-pinene, sabinene, α-terpinene, limonene, *p*-cymene, α-cubebene, terpinen-4-ol, and isocembrene, with *p*-cymene being the most abundant.

In oil of olibanum from *Boswellia* sp., de Rijke et al. (1978) found: *o*-cresol, *m*-cresol, *p*-cresol, thymol, carvacrol, α-campholenic acid, γ-campholenic acid, and α-campholytic acid. De Rijke et al. (1982) reported 10-thujanic acid in olibanum oil.

Maupetit (1985) reported in the resinoid and oil of olibanum: Δ^3-carene, *cis*-β-ocimene, *trans*-β-ocimene, *p*-isopropenyltoluene, α-bourbonene, β-cubebene, γ-elemene, calarene, guaia-6,9-diene, *cis*-α-bisabolene, β-patchoulene, selina-5,7(11)-diene, germacrene D, *trans, trans*-α-farnesene, α-curcumene, cadalene, methylbenzyl ether, *cis*-limonene oxide, *cis*-carane oxide, *trans*-limonene oxide, *trans*-anethole, cedrol oxide (8,14-cedrane oxide), caryophyllene oxide, 8-epoxyhumulene, n-nonanal, n-decanal, phenylacetaldehyde, α-amylcinnamaldehyde, α-hexylcinnamaldehyde, β-thujone, chrysanthenone, *p*-methylacetophenone, piperitenone, *cis*-jasmone, *cis*-β-hexenol, 3-octanol, 2-octanol, *cis*-linalool oxide (furan), *trans*-linalool oxide (furan), α-terpineol, *p*-mentha-1,4-dien-8-ol, dihydrocarveol, myrtenol, α-campholenic alcohol, *trans*-sabinol, *cis*-sabinol, *cis*-carveol, *p*-cymenol (8-cymenol), *trans*-carveol, cubebene alcohol, T-bourbonol, perillic alcohol, *cis*-nerolidol, nootkat-1(10)-en-7-ol, *epi*-cubenol, *trans*-nerolidol, β-bisabolol, β-elemol, cuminic alcohol, spathulenol, T-cadinol, β-eudesmol, α-bisabol, T-amorphol, coapenol, caryophyllo-3(12),7-dien-6-ol, amyl n-butyrate, isoamyl α-methylbutyrate, isoamyl isovalerate, hexyl butyrate, fenchyl acetate, isobornyl acetate, *trans*-sabinyl acetate, isoamyl benzoate, cedryl acetate, undecanoic acid, tridecanoic acid, monounsaturated tridecanoic acid, diunsaturated tridecanoic acid, monounsaturated tetradecanoic acid, pentadecanoic acid, monounsaturated pentadecanoic acid, margaric acid, monounsaturated heptadecanoic acid, stearic acid, and monounsaturated nonadecanoic acid.

The gum portion from *B. carteri* was examined by El-Khadem and Megahed (1956). They found 2 polysaccharides: #I composed of 1 galactose: 1 arabinose and #II composed of 2 galactose: 1 galacturonic acid.

MYRRH

Myrrh is a natural oleo-gum-resin composed of about 3–8% essential oil, 30–60% water-soluble gum, and 25–40% alcohol-soluble resins (Guenther, 1950; Peyron, 1978; Tyler, 1982). Myrrh typically consists of rounded or irregular tears of yellow to red color, often covered with a lighter-colored dust (Arctander, 1960).

Myrrh is derived from species of the genus *Commiphora* of the Burseraceae. A number of oleo-gum-resins called bdelliums are produced in Arabia and Somalia from various species of *Commiphora* and resemble myrrh; these were probably counted as myrrh in classical times (Groom, 1981) and are probably used for adulteration today. The "perfumed bdellium" (opopanax or *bisabol* myrrh) from *C. erythraea* (Ehrenb.) Engl. in DC was probably the *'ntyw* ("incense") of the ancient Egyptians and the "scented myrrh" of Pliny and others of classical times. Common myrrh (or *hirabol* myrrh) is obtained from *C. myrrha* (Nees) Engl. in DC; this is the species from which "oil of myrrh," or stacte, was obtained. Abyssinian myrrh is obtained from *C. madagascariensis* Jacq. (*C. abyssinica* (Engl.)). Other species sometimes passing as myrrh or bdellium include *C. africana* (A. Rich.) Engl., *C. anglosomaliae* Chiov., *C. gileadensis* (L.) Christ. (*C. opobalsamum* (L.) Engl.), *C. hildebrandtii* Engl., *C. kataf* (Forsk.) Engl., *C. molmol* Engl. ex Tschirch (Somalian myrrh), *C. mukul* (Hook.) Engl., and *C. schimperi* (Berg) Engl. (Groom, 1981; Howes, 1949; Miller, 1969; Moldenke and Moldenke, 1952; Peyron, 1978; Uphof, 1968; Wild, 1959).

These *Commiphora* species are native to northeast tropical Africa, primarily from Somalia to Egypt (Uphof, 1968). They form dwarfish thickets with *Acacia* and *Euphorbia* (Guenther, 1950). The main shipping ports are Djibouti, Aden, Massua, and Port Sudan (Arctander, 1960).

Commiphora myrrha is a small tree or large shrub to 9 ft. The branches are knotted with branchlets that are pointed and perpendicular to the branches. The trifoliate leaves are small and scanty. The whitish-gray bark is filled with schizogenous gum-oleo-resin reservoirs. The gum is collected by incisions in the bark (Grieve, 1967; Groom, 1981; Guenther, 1950; Howes, 1949; Moldenke and Moldenke, 1952; Walker, 1957; Wild, 1959).

The word myrrh is probably derived from the Assyrian *murru* (Thompson, 1949). The Arabic *murr* corresponds with the Hebrew *môr* in the New Testament (Matthew 2:11). The classical Greeks used the words *myrra* and *smyrna,* while the Latin word was *murra* or *myrrha* (Groom, 1981; Skeat, 1963). The ancient Egyptian word was *anti* (Klein-Rebour, 1963).

Myrrh is included in the "oil of holy ointment" (Exodus 30:23–24) and incense (Exodus 30:34), but, as noted under frankincense, these references do not provide historical evidence for the use of myrrh in the time of Moses. Myrrh is sometimes stated as being mentioned even earlier in the Bible (Genesis 37:25), but here the Hebrew word *lôt* is used; *lôt* is now realized to be correctly translated as labdanum (*Cistus* spp., esp. *C. incanus* L. ssp. *creticus* (L.) Heywood), not myrrh (Groom, 1981; Moldenke and Moldenke, 1952; Walker, 1957). While myrrh is further mentioned in the Old Testament (Esther 2:12; Psalms 45:8; Proverbs 7:17; Solomon's Song 1:13, 3:6, 5:5, 5:13), there is inference that the fragrance in question was a liquid and perhaps not derived from myrrh (Groom, 1981).

As recorded in chapter 10 of Ovid's *Metamorphoses* (Nims, 1965), Myrrha was the daughter of Cinyras, King of Cyprus. Myrrha was cursed by Aphrodite with

an uncontrollable passion for her father because Myrrha's mother boasted that she was more beautiful than Aphrodite herself. "Through a trick of her nurse, Myrrha shared her father's bed night after night, although Cinyras did not realize who she was. When he discovered the truth, he threatened to kill Myrrha, and when she fled, he killed himself. As a result of this incest, Myrrha became pregnant; she was changed into a myrrha [sic] tree, and the trunk of which was split by the goddess of childbirth, and her son Adonis emerged" (Zimmerman, 1964).

Myrrh has been employed for incense and embalming since ancient times (Dörr, 1973; Klein-Rebour, 1962, 1963, 1964; Zahnd and Sapinkopf, 1947). Rough calculations based on Pliny suggest that the total production of myrrh was 450–600 tons/yr (Groom, 1981).

The odor of myrrh is described as warm-balsamic, sweet, and somewhat spicy-aromatic, sharp and pungent when fresh. Myrrh is employed by perfumers as an absolute, oil, or resinoid. It is used in Oriental-spicy bases, chypres, woody bases, forest notes, pine fragrances, etc. It blends well with geranium, musk, patchouly, spices, and the heavier floral bases (Arctander, 1960; Guenther, 1950).

Myrrh is included in the formulations of a number of modern perfumes, including: *Fidji* by Guy Laroche, *Onna* by Gary Farn, *Volcan d'Amour* by Diane von Furstenburg, *Gianni Versace* by Charles of the Ritz, *Leonard Pour Homme* by Denney, *KL* by Lagerfeld, and *Le Jardin* by Max Factor (Fragrance Foundation, 1983).

In flavors, myrrh gives a biting-burning, somewhat acrid-aromatic taste for mouthwashes and toothpastes and blends well with clove, thyme, mint, and wintergreen, imparting a pleasant-aromatic body to gargles and mouthsprays (Arctander, 1960; Furia and Bellanca, 1975).

Many herbalists recommend tincture of myrrh as an astringent for the mucous membranes of the mouth and throat (Macht and Bryan, 1935; Peyron, 1978; Small, 1943). Perhaps this use dates back to the Assyrians, who employed a popular lip-salve of arsenic and myrrh (Adamson, 1969). Myrrh is found in a salve used in treating bed sores, hemorrhoids, and wounds. Internally, myrrh is used for indigestion, ulcers, and bronchial congestion and as an emmenagogue. It is harmless but rather inefficient in these uses (Peyron, 1978; Tyler, 1982). Recently, Maradufu (1982) has found that the furanosesquiterpenoids of myrrh are ixodicidal against the larvae of *Rhipicephalus appendiculatus* (ticks that transmit East Coast Fever to Kenyan cattle).

Because of poor identification of the parent material and frequent adulteration of the commercial myrrhs, the chemical literature is unreliable. The papers that claim to have examined the common myrrh (*C. myrrha*) are few. Guenther (1944) summarized the previous literature on common myrrh and reported: pinene, limonene, cuminic aldehyde, cinnamic aldehyde, eugenol, *m*-cresol, cadinene, heerabolene, formic acid, acetic acid, palmitic acid, and myrrholic acid. Maradufu (1982), who also filed a herbarium voucher specimen, identified 2 furanosesquiterpenoids in a hexane extract of common myrrh.

Ikeda et al. (1962) first examined the essential oil of opopanax (*C. erythraea*) and found that the monoterpene composition was almost entirely ocimene with trace amounts of α-pinene, β-pinene, Δ^3-carene, myrcene, d-limonene, and terpinolene. The essential oil of opopanax was examined by Nigam and Levi (1966), who reported α-bisabolene, β-bisabolene, and γ-bisabolene. Wenninger et al. (1967) reported on the infrared spectra of a number of sesquiterpene hydrocarbons, some of which were isolated from opopanax: α-bergamotene, β-bisabolene, "γ-bisabolene" (later shown by Wenninger and Yates, 1969, to be *trans*-α-bisabolene), γ-cadinene, δ-cadinene, *ar*-curcumene, and α-santalene. Regan

and Andrews (1967) reported on α-santalene and α-bisabolene from opopanax oil. Nigam and Neville (1968) isolated from opopanax oil: α-santalene, α-bisabolene, and β-bisabolene. Wenninger and Yates (1969) isolated from opopanax oil: *trans*-β-ocimene, δ-elemene, α-cubebene, α-copaene, *cis*-α-bergamotene, β-elemene, α-santalene, *trans*-α-bergamotene, caryophyllene, γ-elemene, *epi*-β-santalene, β-santalene, humulene, γ-muurolene, *trans*-α-bisabolene, β-bisabolene, *ar*-curcumene, δ-cadinene, and γ-cadinene. The chromatogram of Wenninger and Yates (1969) indicates that α-santalene and *trans*-α-bisabolene are the major constituents of opopanax. More recently, Delay and Ohloff (1979) have shown that the *trans*-α-bisabolene isolated from opopanax by Wenninger and Yates (1969) is actually *cis*-α-bisabolene. Maradufu (1982) has isolated 2 furanosesquiterpenoids and a furanodienone from a hexane extract of opopanax.

From the essential oil of *C. abyssinica* (*C. madagascariensis*), Brieskorn and Noble (1982a) isolated: δ-elemene; β-elemene; α-copaene; β-bourbonene; germacrene D; β-caryophyllene; humulene; γ-cadinene; δ-cadinene; elemol; 1(10)*E*,4*E*-furanodiene; 1(10)*E*,4*E*-furanodien-6-one; isofuranogermacrene; curzerenone; and lindestrene.

From the essential oil of *C. molmol*, Brieskorn and Noble (1980, 1983a,b) have isolated: three furanogermacrenes (2-methoxy-4,5-dihydrofuranodien-6-one, 3-methoxy-10-methylenfuranogermacra-1-en-6-one, and 5-acetoxy-2-methoxy-4,5-dihydrofuranodien-6-one)lindestrene; furanoeudesma-1 3-diene; furanodesma-1,4-dien-6-one; 1(10)*Z*, 4*Z*-furanodien-6-one; 1(10)*E*, 4*E*-furandien-6-one; 2-methoxyfuranodiene; 2-acetoxyfuranodiene; 4,5-dihydrofuranodien-6-one; and 2-methoxyfuranoguaia-9-en-8-one.

The reports of Noble (1980) and Brieskorn and Noble (1982b) did not state the source of their myrrh but reported, in addition to the above, 2-methoxy-4,5-dihydrofuranodien-6-one, 5-acetoxy-2-methoxy-4-5-dihydrofuranodien-6-one, and 3-methoxy-10-methylene-furanogermacra-1-ene-6-one.

Most recently, Wilson and Mookherjee (1983) reported on the following in oil of myrrh: 11.9% curzerene, 12.5% furanoeudesma-1,3-diene, 1.2% 1,10(15)-furanodien-6-one, 3.5% lindestrene, 11.7% curzerenone, 0.4% furanodien-6-one, 1.1% dihydropyrocurzerenone, 1.5% 3-methoxy-10(15)-dihydrofuranodien-6-one, 0.1% 3-methoxyfuranoguaia-9-en-8-one, 0.2% 2-methoxy-4,5-dihydrofuranodien-6-one, and 0.9% 3-methoxy-10-methylenefuranogermacra-1-en-6-one. These authors also reported that a mixture of furanoeudesma-1,3-diene and lindestrene possessed a typical myrrh odor, while dihydropyrocurzerenone possessed a resinous myrrh odor; the latter compound best represented the odor of myrrh by itself.

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Identification of Biblical Hyssop and Origin of the Traditional Use of Oregano-group Herbs in the Mediterranean Region[1]

ALEXANDER FLEISHER[2] AND ZHENIA FLEISHER[3]

A comparative study of the traditional use of oregano-like herbs in the Mediterranean region provides convincing evidence that the hyssop of the Bible is the carvacrol chemotype of the plant Majorana syriaca. *The ancient tradition of ritual use of this plant gave rise to two cultures of condiments: za'atar in the Middle East and oregano in Europe.*

The flavor of the original hyssop was the determining factor in this development and remained unchanged in oregano and za'atar throughout the centuries.

Природа библейского иссопа и происхождение традиции употребления специй группы орегано в районе Средиземного моря. *Изучение душистых трав из группы орегано /душица/, традиционно употребляемых в районе Средиземноморья, представило убедительные доказательства того, что иссоп, описанный в Библии, является карвакрол-содержащим хемотипом растения* Majorana syriaca.

Древняя традиция ритуального использования иссопа легла в основу развития двух культур специй: за'атара на Ближнем Востоке и орегано в Европе.

Вкус и запах истинного иссопа явились направляющими факторами этого развития. Они сохранились идентичными и неизменными в специях за'атар и орегано на протяжнеии веков.

Oregano is one of the most popular herb condiments throughout the world. Being so well known in daily use, however, it presents a serious problem for scientists trying to establish the identity of its botanical source. Calpouzos (1954) showed that the attempt to find a sole plant source of oregano is unfeasible. Presenting a list of 39 species used throughout the world as sources of the condiment, he concluded that "the condiment name oregano should be understood to refer, not to any species but to a particular spice flavor furnished by plants of several genera in different parts of the world."

In his recent report Lawrence (1984) described the state of the art concerning the botanical identity and the chemical composition of 52 species from six families known to be sources of oregano.

It is known that the main world suppliers of dry oregano herb are Greece and Turkey. Greek oregano, which is considered to be of the highest quality, consists almost exclusively of leaves and flowering parts of *Origanum heracleoticum* auct. (Tucker 1974, 1981). (The name of this taxon was recently corrected to *O. vulgare* L. ssp. *hirtum* (Link) Ietswaart [Ietswaart 1980].) In a recent study of the taxon it was found that its population consisted of at least three chemovarieties similar in their physical appearance, but differing by their essential oil composition and,

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[1] Received 21 November 1986; accepted 14 December 1987.

[2] Florasynth, Inc., 410 East 62nd Street, New York, NY 10021.

[3] Faculty of Agricultural Engineering, Technion-Israel Institute of Technology, Haifa, Israel.

consequently, by their flavor. According to their oil composition and flavor profiles, these chemovarieties were defined as marjoram, thyme, and oregano types.

The two latter types, containing thymol and carvacrol respectively as their main constituents, were found to make up the overwhelming majority of the wild *O. heracleoticum* populations in Greece. It was also shown that the relative distributions of the thyme and oregano types are comparable (Fleisher and Sneer 1982).

However, in each chemical study of the essential oil of Greek oregano, carvacrol and not thymol was found to be the main oil constituent of the condiment (Ietswaart 1980; Lawrence 1984; Rhyu 1979; Stahl et al. 1969). The reason for this was that the carvacrol-containing plants were preferably harvested by the collectors, who knew what they were looking for.

Following Calpouzos' (1954) idea connecting the condiment name "oregano" with a definite flavor, Fleisher and Sneer (1982) concluded that "A high carvacrol content in the essential oil is the key to the concept of the 'oregano' spice and is a prerequisite determining a plant's suitability for the preparation of this condiment." They also concluded that the exclusive collection of carvacrol-containing plants is rooted in the traditional preference of this particular flavor for oregano condiment preparation.

HYSSOP

Searching for the source of this tradition we faced the ancient claims connecting the concept of oregano, on one hand, with the plant hyssop described in the Bible (the name hyssop, the Greek form of the Hebrew word "ezov" [Anonymous 1969; Le Stange 1978], is first mentioned in the Exodus 12:22 description of the Passover ritual) and, on the other hand, with za'atar, a condiment extremely popular in the whole Middle East and especially in the territory of the Holy Land. The claims of most importance are presented below:

(1) At the beginning of our era the hyssop was so well known that Dioscorides (40–90 A.D.), who was the founder of phytotherapy, while not describing hyssop in his *De Materia Medica,* referred to it, explaining the characteristics and the use of the plant origanon (Andrews 1961; Crowfoot and Baldensperger 1932).

(2) Rabbi Saadia Gaon (882–942), a respected Hebrew scholar, says in his commentaries on Exodus 12:22 that hyssop is called za'atar in Arabic and origanum in Latin (Saadia Gaon 1924).

(3) Maimonides (1135–1204), the famous Hebrew theologian and physician, explained the hyssop of the Law as "plainly the za'atar which the people use for their food" (Maimonides 1948).

However, not one, but a number of plants called hyssop (ezov), were known in antiquity in the Holy Land. All of them were used as food additives, but only one was considered by the Hebrews fit (kosher) for ritual purposes. The Mishnah part of the Talmud points out that for the ritual purposes "any kind of hyssop that is given an attached name is invalid: hyssop, simply so-called, is valid; Greek hyssop, stibium hyssop, Roman hyssop or desert hyssop are invalid" (Mishnah, Parah, XI, 7).

Two conclusions may be derived from the aforementioned: (1) The name hyssop was a collective name of a number of plants used for food and endowed with

some common properties; and (2) The concepts of hyssop, oregano, and za'atar are identical; thus different hyssops used in the past most probably correspond to different za'atar plants in our time.

In our work the chemical aspects of the species associated with za'atar condiments have been studied and compared to those of oregano. A fascinating similarity in the tradition of gathering and consuming za'atar and oregano and the practical identity of their flavor profiles has been found. The fact that both concepts—"za'atar" and "oregano"—have been repeatedly connected by ancient investigators to the Bible hyssop led us to believe that the traditional use of za'atar and oregano is, in fact, the transformation of the ritual use of the hyssop in Biblical times, while the flavor of the original hyssop was the connecting factor. An attempt to prove this hypothesis is presented below.

ZA'ATAR

A number of plants are presently called za'atar. The za'atar plants were and are used as a condiment in foods. Thus, our first hypothesis is that the similarity in flavor was the reason that they were given one common name.

In order to check this supposition, we reviewed the species associated with za'atar and studied their essential oils.

Like "oregano," the name "za'atar" is used to designate a universally employed condiment as well as the species used in its preparation. The following za'atar species are commonly known among Arab population in the Holy Land: *Satureja thymbra* L.—za'atar rumi or franji (Roman or European hyssop), savory; *Thymbra spicata* L.—za'atar hommar or sahrawi (donkey or desert hyssop) (Hareubeni and Hareubeni 1950); and *Coridothymus capitatus* (L.) Reichenb.—za'atar farsi (Persian hyssop), Spanish oregano (Crowfoot and Baldensperger 1932; Zaitschek and Levontin 1971).

In the Holy Land, however, for the preparation of za'atar condiment these plants are very rarely used. The za'atar par excellence, used by the overwhelming majority of the oriental communities and the only za'atar without a name attached, is *Majorana syriaca* (L.) Raf. (Crowfoot and Baldensperger 1932; Feliks 1968; Hareubeni and Hareubeni 1950).

The compositions of the essential oils that determine the flavor of the condiments are described in the literature. The oil of *Coridothymus capitatus* is known as Spanish origanum essential oil. Its composition was studied in detail by Albers (1942), Guenther (1949), Igolen (1970), Lawrence (1984), and Sendra and Cunnat (1980). It contains 5–20% p-cymene and a minor amount of thymol. Each study concluded that in the essential oil of *C. capitatus* the main constituent, carvacrol, usually amounts to about 70%. Recently, it was shown that the plant population of *C. capitatus* in Israel and West Bank of Jordan River consists of three chemovarieties differing in carvacrol:thymol ratio (Fleisher et al. 1984).

The chemical composition of *Satureja thymbra* oil resembles that of origanum oil. The aromas of both oils are similar; the expensive savory oil is sometimes adulterated with the oil of *Coridothymus capitatus*. Carvacrol is also the main component of savory oil (Albers 1942; Guenther 1949).

Thymbra spicata plants are practically not used for condiments. However, the composition of *T. spicata* oil is similar to the *Coridothymus capitatus* and *Satureja*

TABLE 1. CHEMICAL COMPOSITION OF DIFFERENT ZA'ATAR SPECIES.

Compound	Percentage composition: *Coridothymus capitatus*[a] (Greece)	*Stureja thymbra* (Israel)	*Thymbra spicata* (Israel)
α-thujene	0.6	1.7	0.6
α-pinene	0.8	0.8	0.3
camphene	0.1	0.1	
β-pinene	0.1		
myrcene	1.8	2.1	0.6
α-phellandrene	trace	0.2	
α-terpinene	1.2	0.8	
limonene	0.3	0.6	
1,8-cineole	0.3		
γ-terpinene	5.3	15.9	6.6
ρ-cymene	5.5	12.4	25.6
terpinolene	0.3		
1-octen-3-ol	0.4		
linalool	0.5	0.8	
terpien-4-ol	0.7	0.4	0.3
borneol	0.2		
α-terpineol	0.1		
caryophyllene	3.0	4.1	0.4
thymol	0.4	0.9	0.2
carvacrol	73.6	55.2	63.1

[a] cf. Lawrence (1984).

thymbra oils and its carvacrol content also reaches 70% (Gildemeister and Hoffmann 1961). Detailed composition of the essential oils of this species is shown in Table 1.

The essential oil of *Majorana syriaca* has also been studied in the past. Guenther (1949) quoted the results of analysis of oil from *Origanum maru* L. (the previous name of *M. syriaca* [Feinbrun-Dothan 1978]) and layed stress on the sample containing about 60% thymol. Investigation of *M. syriaca* oil, carried out by Zaitschik and Levontin (1971), also showed thymol to be the main component of the oil.

If this is so, then the flavor of the main za'atar plant—*Majorana syriaca*—differs considerably from the flavor of other members of that group, and the basic assumption about the similarity of the flavors of the za'atar plants is not correct.

However, it is also possible that the chemical studies of *M. syriaca* were incomplete and that the populations of this species, as in the case of *Origanum,* could consist of a number of chemotypes and, among them, could be plants containing carvacrol as a major component.

We undertook a thorough chemical study of the essential oil from wild populations of *M. syriaca* in the Holy Land.

EXPERIMENTAL

Samples of *Majorana syriaca* plants were obtained the following way:

In every region where a developed population of *M. syriaca* plants was found, an area of approximately 0.1 ha was randomly chosen for sample collection.

TABLE 2. PHENOL CONTENT IN ESSENTIAL OILS OF *MAJORANA SYRIACA* SAMPLES FROM DIFFERENT LOCATIONS IN THE HOLY LAND.

Population	Date of sample collection	Content in percent: Essential oil in plant	Thymol in essential oil	Carvacrol in essential oil
Main chemotype: thymol				
Mt. Meron, Upper Galilee	10.6.79	3.8	64.9	5.0
Pqe'in, Upper Galilee	2.11.78	1.3	57.1	3.1
Kishor, Upper Galilee	2.11.78	1.1	60.6	2.1
Admit, Upper Galilee	23.12.78	0.6	46.9	1.4
Nin Village, Izreel Valley	19.9.78	2.5	70.7	11.2
Kfar Hasidim, Zevulun Valley	14.9.78	5.0	68.2	9.3
Rachasim, Zevulun Valley	15.9.78	2.4	57.4	3.0
Churshat HaArbaim, Mt. Carmel	4.11.78	1.8	42.8	3.3
Menashe Forest, Manassia Mts.	4.11.78	1.1	56.6	4.7
Sebastia, Samaria	25.1.79	1.4	61.8	5.3
Mescha Village, Samaria	14.4.79	2.1	63.5	3.4
Ramalla, Judean Mts.	25.1.79	2.5	54.0	3.8
Abu Ghosh, Judean Mts.	20.5.79	2.3	67.0	1.9
Beit Jalla, Judean Mts.	20.5.79	2.4	58.6	4.9
Main chemotype: carvacrol				
Mt. Pua, Upper Galilee	17.6.79	3.5	1.5	74.3
Kibbutz Lavy, Eastern Galilee	23.12.78	1.2	4.8	50.4
Ibten Village, Zevulun Valley	14.9.78	2.6	0.6	70.0
Yokneam, Manassia Mts.	15.2.79	1.0	17.9	60.4
Ma'ale Gilboa, Gilboa Mts.	21.1.79	0.5	4.5	64.9
Kabatia, Samaria	25.1.79	1.9	0.9	61.0
Wadi D'uk, Samaria	17.6.79	3.0	1.9	74.9
Beit-Shemesh, Judea	20.5.79	2.5	12.0	55.1

Representative samples of plant material were gathered by taking one branch of each *M. syriaca* plant growing on the plot.

Za'atar condiment samples were bought in market places in different towns and villages of Israel and West Bank of the Jordan River or were given to us by the people from their home-made stocks.

From each plant sample and condiment sample the essential oil was distilled using the commonly known Clevenger trap (Guenther 1949).

The obtained oil samples were analyzed by gas-chromatography. Packard G C, Model 7400 with a flame-ionization detector was provided with glass columns 8 × ⅛″ packed with 5% Carbowax 20 M and 5% SE-30 on CW AW 80-100 mesh.

The operating conditions were as follows:

Initial column temperature 80°C, programmed at rate of 5°C/min to 210°C. Inlet temperature 270°C, detector oven temperature 230°C, carrier gas nitrogen, flow rate 30 ml/min, hydrogen flow rate 35 ml/min, air flow rate 300 ml/min. The sample volume injected was 0.1 ml. The peaks were registered by Unicorder Model U-225 M recorder and integrated with Spectra-Physics System-1 computing integrator. Peaks were identified by comparison of their relative retention time (with camphor as standard) with that of known compounds. For the control of identification correctness, the peak enrichment method was used.

TABLE 3. PHENOL CONTENT OF ESSENTIAL OIL OF ZA'ATAR SPICE.

	Content in percent		
Source of za'atar spice	Essential oil in condiment	Thymol in essential oil	Carvacrol in essential oil
Spice type: thymol			
Nin Village, Izreel Valley	2.5	71	11
Usfyia Village, Mount Carmel	1.7	68	3
Fureidis, Mount Carmel	1.6	84	4
Nablus, Market Place, Semaria	0.6	41	19
Old City Jerusalem, Market Place	0.4	62	3
Old City Jerusalem, Market Place	0.4	48	22
Spice type: thymol and carvacrol			
Horfesh Village, Upper Galilee	1.3	44	46
Haifa, Market Place	3.2	30	49
Jenin, Market Place, Samaria	0.3	29	36
Nablus, Market Place, Samaria	0.5	34	24
Nablus, Market Place, Samaria	1.2	40	22
Old City Jerusalem, Market Place	0.7	41	36
Gasa Market Place	1.3	53	44
Spice type: carvacrol			
Gush Halav Village, upper Galilee	0.8	15	64
Horfesh Village, Upper Galilee	2.1	7	59
Jatt Village, Lower Galilee	3.3	10	65
Hilf Village, Zevulun Valley	4.4	4	76
Bosmat Tivon, Zevulun Valley	2.7	14	77
Bosmat Tivon, Zevulun Valley	2.5	8	73
Haifa, Market Place	1.0	34	55
Haifa, Market Place	1.5	17	61
Jenin, Market Place, Samaria	0.8	20	52
Jenin, Market Place, Samaria	2.3	5	70
Jalbun, Gilboa Mountains	0.5	5	65
Kabatia Village, Samaria	0.9	2	75
Tul-Karem, Market Place, Samaria	0.8	3	69
Nablus, Market Place, Samaria	1.7	7	59
Nablus, Market Place, Samaria	2.4	4	67
Old City Jerusalem, Market Place	0.2	28	54
Old City Jerusalem, Market Place	2.8	20	41
Old City Jerusalem, Market Place	0.2	18	52
Old City Jerusalem, Market Place	1.3	9	64
Arrub Village, Judea	2.1	1	77
Hebron, Market Place, Judea	2.8	2	71
Gasa, Market Place	1.6	3	66

DISCUSSION

The data obtained from our study of *M. syriaca* are summarized in Table 2. The data in Table 2, in fact, testify to the existence of two chemotypes of *M. syriaca*. One of these chemovarieties is rich in carvacrol, but substantially less widely distributed (Fleisher et al. 1980). The flavor of the essential oils of this plant type is very similar to those of the essential oils of *Coridothymus capitatus, Satureja thymbra* and *Thymbra spicata.*

In the next step of our investigation, we analyzed the essential oil from home-

TABLE 4. CHEMICAL COMPOSITION OF CARVACROL-TYPE ESSENTIAL OILS OF *MAJORANA SYRIACA* AND *ORIGANUM VULGARE* SPP. *HIRTUM*.

	Percentage composition	
Compound	*Majorana syriaca*	*Origanum vulgare* spp. *hirtum*
α-pinene	0.5	0.3
camphene	0.1	0.2
β-pinene	0.2	
myrcene	1.1	0.8
α-phellandrene	0.2	0.1
α-terpinene	1.2	0.8
limonene	0.2	0.3
1,8-cineole	0.4	0.2
γ-terpinene	7.2	15.0
p-cymene	10.3	5.9
terpinolene	0.1	
linalool	0.3	0.4
terpinen-4-ol	0.5	0.7
β-caryophyllene	1.3	1.0
α-terpineol	0.4	0.3
borneol	1.4	1.1
thymol	0.3	0.4
carvacrol	69.5	67.3

made and commercial za'atar spices prepared from *M. syriaca*. The results are shown in Table 3.

It can be seen from the data in Table 3 that the carvacrol type of *M. syriaca* is preferred for the preparation of condiments, in spite of its narrower distribution. To verify this, the analysis of variance (F-test) (Snedecor 1946) was carried out for data in Table 3, taking into account null hypothesis of no grouping among these data. The F-test yielded that the division of condiment samples according to their carvacrol content is significant at 99% level. Consequently, the carvacrol type of *M. syriaca* is the real za'atar.

Thus, our first hypothesis is confirmed. The term za'atar, in fact, refers to different species that exhibit the similarity of their flavor characteristics.

The comparison of chemical compositions of the essential oils from carvacrol types *Majorana syriaca* and *Origanum vulgare* spp. *hirtum* is presented in Table 4.

It can be seen that the compositions of both oils are very similar. For this reason, the flavors of the condiments prepared from both species, are, in fact, identical. This, in turn, explains and supports the identity of terms "za'atar" and "oregano" stated many centuries ago.

Summarizing the above, we observed that both za'atar and oregano source plant populations consist of two chemotypes. These chemotypes have no visual distinguishing characteristics whatsoever and differ only by flavor. Based on the above, it is obvious that in countries where za'atar and oregano are traditionally used, the carvacrol-containing type of plants is evidently preferred for condiment preparation. This means that the presence of significant quantities of carvacrol is necessary for plants to be za'atar as well as oregano and is also the basis connecting both concepts.

We can now return to the Biblical hyssop.

TABLE 5. ESSENTIAL OIL CONTENT AND PHENOL COMPOSITION IN *MAJORANA SYRIACA* PLANTS IN MOUNT SINAI AREA.

Sampling site	Essential oil content %	Percentage composition	
		Thymol	Carvacrol
Wadi Tufhah	6.6	0.2	88.1
Wadi Irabah	5.7	0.2	83.3
Entrance to Wadi Rutig	7.1	4.8	72.3
Wadi Shabaiyeh	7.6	0.2	75.4
Gebel Musa (Mt. Moses, Mt. Sinai)	7.5	0.3	85.4

After centuries of apparently hopeless scientific and theological disputes, botanical and folklore research of the last decades leaves no doubt that *Majorana syriaca* is actually the hyssop of the Bible.

While referring the reader to the manifold and convincing proofs of this fact (Andrews 1961; Crowfoot and Baldensperger 1932; Feliks 1968; Hareubeni 1984; Hareubeni and Hareubeni 1950; Moldenke and Moldenke 1952), we think it necessary to point out that the Samaritans, faithful to their ancient traditions to this day, use this plant as the hyssop of their Passover ritual.

As stated at the beginning of our paper, the term hyssop had been identified with the terms za'atar and oregano. In this case it is natural to suppose that the hyssop, known long before oregano and za'atar and being their progenitor, ought to have a flavor identical to theirs.

Developing this idea, we formulate now our second hypothesis. The Biblical hyssop, originally known to the ancient Hebrews, belonged to only one species, and this plant was the carvacrol-bearing chemotype of *Majorana syriaca.*

Looking for proof of our hypothesis we referred to the Bible. After the first mention of hyssop in Exodus 12:22, a description of its use in the purification rites is given by Moses when expounding to the people the Law received by him on Mount Sinai (Leviticus 14:6). No characteristics of hyssop were given there. We may assume that the plant evidently grew on the spot and Moses could show it to the people. In other words, if our hypothesis is correct, the carvacrol type of *M. syriaca* must grow in the region of Mt. Sinai.

There are no data about the exact location of Mt. Sinai in Jewish tradition. Christian and Moslem traditions have been locating Mt. Sinai at the present Gebel Musa (Mt. Moses) in the region of the southern highlands of the Sinai peninsula.

A short expedition to this region was undertaken by us in summer 1979 and again in 1984. On the granite slopes of Mt. Moses we found a developed population of *M. syriaca.* No other species used for za'atar spice preparation were found to grow in the area. The analysis of essential oils obtained from samples of these plants proves that only the carvacrol type of *M. syriaca* that possesses a uniquely high essential oil content grows in the Mt. Sinai (Mt. Moses) region (Table 5).

The Beduin of the Jabaliah tribe, living for centuries on the highlands of Sinai around the Greek monastery of St. Katherina situated on the slopes of Mt. Moses, call this plant za'atar in Arabic, or rigany (oregano) in Greek.

So, all data obtained are in complete agreement with our hypothesis and as a result we come to the following conclusions:

Biblical hyssop is the carvacrol chemotype of the plant *Majorana syriaca.*

This plant, having a curative value, was an important part of the purification rites and was also used as a medicine and food additive. Later the ritual use was concentrated in the hands of priests well versed in the knowledge of the original hyssop identification marks. For daily use as a condiment, where flavor alone mattered, a number of plants were found having the same odor as the hyssop, such as *Coridothymus capitatus, Saturea thymbra, Thymbra spicata,* and later *Origanum vulgare* ssp. *hirtum.* This became the cause of ensuing remarks in religious literature concerning the necessity of choosing the right hyssop for ritual use, and much later the cause of learned discussions. After the destruction of the Jerusalem Temple at the beginning of our era, the ritual use of hyssop ceased, while the tradition of using hyssop as a flavoring continued to exist, giving rise to two cultures of condiments: za'atar in the east and oregano in Europe.

The populations of species used in the preparation of both condiments consist of two chemotypes of different flavors. However, the odor of the original hyssop ("ezov") was the determining factor in the development of traditional cultures of za'atar and oregano in the Mediterranean region. For this reason, the carvacrol-containing chemotypes are preferably collected for the preparation of both spices today.

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Book Review

The State of Medicinal Plants Research in Nigeria. Abayomi Sofowara (ed.). Ibadan University Press, Ibadan, Nigeria; available from Dr. James L. Edwards, Dept. of Philosophy, Nassau Community College, Garden City, NY 11530. 1986. 404 pp. $35.00 (paper).

This book represents the proceedings of a workshop held in Ife, Nigeria, in 1986, and reports efforts to identify Nigerian and other African medicinal plants that could yield drugs for local use. A wide range of subjects can be found among the 11 plenary lectures, 26 contributed papers, 2 invited foreign contributions, and 19 abstracts. Some orient the reader to social aspects of herbal medicine in Nigeria and thus set the stage for the papers on the pharmacological aspects that follow. Working groups integrate these data into four reports that outline the status of medicinal plant research and the research priorities that should be undertaken to achieve the goal of the conference. The titles of these working groups include: Traditional Medicine, Botany, Cultivation and Standardization of Medicinal Plants; Chemical Investigation of Medicinal Plants for Active Principles; Pharmacology, Toxicology, Clinical and Veterinary Applications of Medicinal Plants; and Drug Production from Medicinal Plants. Their conclusions, presented in outline form, are of value to those attempting to establish guidelines for studies integrating traditional healing practices with modern medicine. This volume also presents a reasonable overview of the status of medicinal plant research in Nigeria, and remains useful as a reference to those studying tropical plants as a source of new or interesting drugs.

MEMORY ELVIN-LEWIS, WASHINGTON UNIVERSITY, ST. LOUIS, MO 63110

Sage as a Condiment in the Graeco-Roman Era
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Sage as a Condiment in the Graeco-Roman Era

Several species of Salvia contributed to this flavoring and preserving adjunct of food in classical times.

ALFRED C. ANDREWS
Department of Classics, University of Miami, Coral Gables, Fla.

The major difficulty encountered in any discussion of the use of sage as a condiment in the classical period is determination of the meaning of the names then current. At that time there was no concept of botanical species in the modern sense, and even technical writers were apt to apply the name of a plant in common use to other less common members of the genus with similar medicinal properties, and to do so without qualification. The Greeks used four basic terms for various types of sage: σφάκος, ἐλελίσφακος, ὅρμινον, and αἰθιοπίς. The meaning of these names can be only approximately fixed.

The term σφάκος was probably applied to the plant because of its astringent property, for the word is apparently cognate with σφάκελος, which means "convulsion" or "spasm" (7). The σφάκος of Theophrastus (H.Pl. 6.1.4; 6.2.5) has been identified as *Salvia calycina* Sibth. (35) and *S. officinalis* L. (13, 17). The former species is fairly common in Attica, Boeotia and Argolis (16, 18). The latter, which is easily confused with *S. triloba* L., occurs mostly on the Greek islands (16). On the basis of habitat, the former is a more acceptable identification. The σφάκος of Aristophanes has been identified as *S. pomifera* L. (21); but since this species is found mostly on Crete and some of the Greek islands (16, 29), it is probably not the plant to which Aristophanes referred. The classical name has mostly died out of use, although it survives in Otranto in the forms *spaka* and *sfaga*, generic terms for sage (30).

Ἐλελίσφακος is apparently a compound of σφάκος and ἐλελι- from ἐλελίζω, "to convulse, quiver" (33). The type described by Theophrastus (H.Pl. 6.1.4; 6.2.5) has been variously identified as *Salvia triloba* L. (35), *S. calycina* Sibth. (15) and *S. officinalis* L. (34). The type described by Dioscorides (3.35) has usually been identified as *S. officinalis* L. (1, 11, 15, 32, 34), but also as *S. pomifera* L. (24), as *S. officinalis* and *pomifera* (6), and as *S. calycina* and *triloba* (13). There is also an inclination to identify this plant in Galen and other medical writers as *S. officinalis* (19). One writer, aware of the inclination to extension, concluded that the word usually referred to *S. officinalis* but was probably also applied to *S. pomifera, cretica* and *argentea* on Crete and to *S. ringens, calycina, Sibthorpii* and *Forskalei* in Greece.

Modern Greek ἀλισφακιά on Corfu is a generic term applied to such species as *Salvia calycina, pomifera, officinalis, triloba* and *verticillata* while ἄγρια ἀλισφακιά generally denotes *Salvia calycina*. *Salvia triloba* is the type of sage most common in Greece (4, 16, 18), the western limit of its range lying in Sicily and Calabria (29), and is probably the species to which the classical term generally referred. The galls of this species were formerly used on Crete to season a type of bread (29). By reason of habitat, as already pointed out, application of this name to either *Salvia officinalis* or *pomifera* must have been exceptional. *Salvia argentea* L. is not common in Greece but has been found in Phocis, Attica, Thessaly and Epirus (16). *Sal-*

via viridis L. occurs here and there at lower altitudes in Greece and on the islands (16). *Salvia sclarea* L. is fairly common in Epirus, Etolia and the Peloponnesus (16), and its leaves are used to some extent in cookery today in Europe (20). *Salvia officinalis,* however, is the type most commonly used today. Its leaves provide a popular seasoning for dressings, especially for such meats as pork, goose and duck; and it is also one of the most important flavoring ingredients in certain kinds of sausage and cheese (20).

Ὅρμινον probably derives from ὁρμή, " impulse ", and therefore means " an impellent " (33). The plant has usually been identified as horminum clary or common sage, *Salvia horminum* L. (11, 14, 15, 22, 23, 24, 32, 35), and as both *S. horminum* and *S. sclarea* (13), the wild type as perhaps *S. viridis* (14). One scholar identified the type described by Dioscorides as *S. horminum* but thought that the type described by Theophrastus was probably a different species (10). *Salvia horminum* L. occurs in cultivated fields and marginal lands at lower altitudes here and there throughout Greece (16). There is little doubt that the classical name generally denoted this species, although current Italian names from this source, prevalent chiefly in Tuscany and Sicily, are applied to various species. One limiting factor is that the name is applied without qualification to only three species. *Salvia horminum* L. is called " ormino " in Tuscany, as is also *Salvia pratensis* L., and *Salvia sclarea* L. is called " ormin " in Piedmont (28). The term is applied with qualifying epithets to several other species. *Salvia canariensis* L. is called " orminu majuri " in Sicily; *Salvia clandestina* Sibth. is called " orminu sarvaggiu " and " orminu pilligrinu " in Sicily; *Salvia glutinosa* L. is called " ormino salvatico " in Tuscany; and *Salvia verticillata* L. is known as " ormino spurio " in Tuscany (28). Whatever the application in classical Greece, that in Italy apparently was to one or more of the first three species, and of these *Salvia horminum* is the most likely possibility.

The αἰθιοπίς of the Greeks was probably named for its homeland, Ethiopia (33). The type described by Dioscorides (4.103) has generally been identified as Ethiopian sage, *Salvia aethiopis* L. (6, 10, 11, 14, 15, 23, 32). The type which Dioscorides says grew on Mt. Ida may have been *Salvia argentea* (14). *Salvia aethiopis* does not occur wild in Greece today but is met, although rarely, at moderate altitudes in northern Italy (3, 8, 12, 16, 23, 27). It is often called " etiopide " in Tuscany (28).

The ἀπουσί (properly ἀνουσί) of Dioscorides (3.35) may be *Salvia aegyptiaca* L. (25). This type was imported from Egypt and used in medicine.

No such variety of nomenclature is found in Latin. The Romans were inclined to borrow the Greek names, but they had one distinctive term of their own. This was " salvia ", perhaps a derivative of " salvus ", denoting " in good health " and applied to sage as a healing plant (37), or perhaps rather a cognate of " saliunca ", a word of uncertain origin used as a name for French spikenard, *Valeriana celtica* L. (36). Pliny (N.H. 22.147) identifies this with the ἐλελίσφακος of the Greeks, which must generally have been *Salvia triloba*; but available evidence suggests that the " salvia " of the Romans was generally garden sage, *Salvia officinalis*. *Salvia triloba* occurs chiefly in southern Italy and Sicily (3, 8, 12, 27, 29), while *Salvia officinalis* grows here and there through most of Italy (3, 5, 9, 12). Salvia has, in fact, been identified as *Salvia officinalis* by most of the authorities (13, 14, 17, 31, 34). The Latin word is the source of Romanian " salbie ", Italian " salbia ", Sicilian " sarvia ", Provençal

" saubja " and "salvatage ", French " sauvaga " and " sauge ", Catalan and Spanish " salvia ", and Portuguese " salva ", all general terms for sage (26). But most of the Italian dialectic names from this source denote *Salvia officinalis*, this being the only species of sage, in fact, to which these names are commonly applied without qualification (28). Names in this category are applied to other species of sage, such as *Salvia pratensis* L., *S. sclarea* L., *S. triloba* L., *S. coccinea* Juss. and *S. glutinosa* L., but nearly always with a qualifying epithet (28). This usage suggests that the classical application was to *Salvia officinalis*. This assumption is supported by the fact that, even though *Salvia horminum* and *S. sclarea* are not uncommon in most of Italy (3, 5, 8, 9, 12, 27), and *S. viridis* L. occurs in southern Italy (12), they are known by other names. How strictly limited the application of " salvia " was to certain members of the genus *Salvia*, and largely to *S. officinalis* in particular, may be judged from the fact that Pliny (N.H. 26.31) records only one use of the term as a secondary name for a member of another genus, specifically, his second type of " bechion ", perhaps *Verbascum lychnitis* L.

Theophrastus describes both σφάκος and ἐλελίσφακος as spineless wild undershrubs (H.Pl. 6.1.4), but says that ὅρμινον was sown later than cereals and pulses (H.Pl. 8.1.4) and at the same time as sesame (H.Pl. 8.7.3). The accounts of Dioscorides (3.35) and Pliny (N.H. 22.146) confirm the fact that ἐλελίσφακος was not under cultivation. Similarly, both Dioscorides (3.135) and Pliny (N.H. 18.49,96) confirm Theophrastus' references to the cultivation of ὅρμινον. The total lack of references to " salvia " in the Latin writers on agriculture indicates that this type of sage was not cultivated in Italy. There is little doubt, therefore, that horminum clary, *Salvia horminum*, was the type of sage cultivated by the Greeks and the Romans.

The ancient physicians have very little to say regarding the dietetic properties of sage. Hippocrates (On diet, 2.45) speaks of ὅρμινον seed as nourishing, astringent and somewhat refreshing; and Galen (De alim. fac., 1.33) says that it was eaten in fried form like flax seeds and poppy seeds with honey mixed in, but was low in nutritive value.

References to the use of sage as a seasoning are very rare. Σφάκος is mentioned as a condiment by two comic writers (Alexis, in Athen. 4.170.b; Aristoph., Thesm. 486). "Salvia" is listed as a stock dry seasoning by Vinidarius (2). Wine was sometimes spiced with ἐλελίσφακος (Diosc. 5.61; Plin. N.H. 14.111). There is some discussion of medical uses of sage in such authors as Dioscorides and Pliny, but no direct allusion to its employment as a spice for food. Furthermore, it is ignored by Athenaeus and wholly unmentioned in the cookbook of Apicius. The conclusion is therefore inescapable that no type of sage played a role of any importance in fine cookery in the classical era. There is only the negative evidence of the fact that horminum clary was under active cultivation, coupled with the knowledge that medical opinion generally favored the use of wild forms of a plant as being more efficacious than the cultivated. This suggests that horminum clary enjoyed a certain vogue in ordinary cookery, and that it was utilized in medicaments and unguents. The other types of sage were probably gathered wild by country people and used to a limited extent in rustic cookery.

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Utilization Abstract

Mbocaya Palm. Millions of this palm, *Acrocomia totai,* grow wild in Paraguay and have long been valued there, first by the aborigines and subsequently by European settlers who have relished the sweet edible pulp of the fruits and have utilized the oil contained in them.

Oil is obtainable from both the pulp and the kernel, and the latter has entered into the manufacture of soap in Paraguay for about 50 years. By 1951 annual production of the kernel oil reached 2,849 metric tons. Commercial production of pulp oil began later and has not exceeded 1,125 tons in any one year.

Prior to 1952 the kernel oil was used commercially only for the manufacture of soap, but that year the oil was refined and marketed for edible use. The inferior pulp oil has been used only in soap. (K. S. Markley, *Jour. Amer. Oil Chem. Soc. 22: 405. 1955*).

Ancient Egyptian herbal wines

Patrick E. McGovern[a,1], Armen Mirzoian[b], and Gretchen R. Hall[a]

[a]Museum Applied Science Center for Archaeology, University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia, PA 19104; and [b]Scientific Services Division, Alcohol and Tobacco Tax and Trade Bureau, U.S. Treasury, Beltsville, MD 20705

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Chemical analyses of ancient organics absorbed into pottery jars from the beginning of advanced ancient Egyptian culture, *ca.* 3150 B.C., and continuing for millennia have revealed that a range of natural products—specifically, herbs and tree resins—were dispensed by grape wine. These findings provide chemical evidence for ancient Egyptian organic medicinal remedies, previously only ambiguously documented in medical papyri dating back to *ca.* 1850 B.C. They illustrate how humans around the world, probably for millions of years, have exploited their natural environments for effective plant remedies, whose active compounds have recently begun to be isolated by modern analytical techniques.

ancient medicine | biomolecular archaeology | herbs | Middle East | wine

Before the rise of modern medicine and likely extending back into the Paleolithic period, humans treated disease and physical ailments by experimenting with natural products derived from plants, other animals, and minerals (1). Fruit-bearing trees, which appeared around 100 million years ago (Mya), offered unparalleled access to sugar and ethanol. The latter had already established themselves as prime energy sources in the animal kingdom. The sweet liquid that oozes out of ruptured ripened fruit provides the ideal conditions of water and nutrients for yeast on their surfaces to multiply and convert the sugar into alcohol (2).

A close symbiosis developed between plants and animals over time, in which the plants provided nourishment and other benefits to the animals, which, in turn, pollinated the plants' flowers, dispersed their seeds, and carried out other functions. The smaller molars and canines of *Proconsul* and other early hominid fossils as early as 24 Mya (3) were well adapted to consuming soft fleshy foods like fruit. These dentitions are broadly comparable to those of modern apes, including gibbons, orangutans, and lowland gorillas, which obtain most of their calories from fruit. Modern chimpanzees, whose genome is the closest to *Homo sapiens*, consume over 90% plants, of which more than 75% is fruit. It can be concluded that early hominids and their descendants favored ripe, often fermented, fruit for millions of years.

In the warm tropical climate of sub-Saharan Africa, where the human species emerged, sweet fruit slurries can achieve an alcoholic content of 5% or more (2). If early hominids were primarily fruit eaters, at least up until about 1–2 Mya, when they began focusing more on tubers and animal fat and protein, they can be expected to have adapted biologically. One result, among many, is that about 10% of the enzymes in the human liver, including alcohol dehydrogenase, function to generate energy from alcohol (4). The genetic underpinnings of the presumed early human penchant for alcoholic fruit compotes, according to the so-called "drunken monkey hypothesis" (5), has been partly borne out by the diet of Malaysian tree shrews (6). These nocturnal animals, which belong to a family believed to be ancestral to all living primates from more than 55 Mya ago, spend their nights feasting year-round on a frothy strongly scented palm "wine," with an alcoholic content as high as 3.8%.

Plant fruits, exudates (including resins and nectar), and other structures, (such as flowers, roots, and leaves), also contain many additional compounds with anesthetic, antimicrobial, and psychotropic properties that early humans likely exploited (1, 7). Although some of these compounds might have been intended to protect the plants from predation, they could also have benefited host animals. By trial and error, humans might well have made use of some of these properties by preparing "medicinal wines" and external salves in which the plant products were dissolved or decocted in alcoholic media.

At present, the earliest biomolecular archaeological evidence for plant additives in fermented beverages dates from the early Neolithic period in China (8) and the Middle East (9), when the first plants and animals were taken into domestication and provided the basis for complex society and permanent settlement. Possibilities for extending the evidential base back into the Paleolithic period are limited by the lack of containers, which were probably made from perishable materials, such as wood, leather, or woven textiles. Under the right environmental conditions, however, we can expect future discoveries. For example, at Monte Verde in Chile, around 13,000 B.P., the bog-like conditions of one of the first human settlements in the Americas resulted in the preservation of an incredible diversity of marsh, dune, mountain, and sea plants, which were likely exploited for their alcoholic, medicinal, and nutritional benefits (10).

The dry climate of Egypt has similarly contributed to excellent preservation of ancient organic materials, in addition to providing very detailed literary and botanical evidence for medicinal wines from one of the most long-standing ancient traditions (11, 12). We deliberately chose samples from 2 ancient Egyptian jars that illuminate the earliest and latest stages of Egyptian winemaking history and applied highly sensitive chemical techniques to obtain biomolecular information about what the vessels originally contained. Because we had already analyzed both samples by less precise methods, the latest results provide a means to test our previous results and conclusions; at the same time, they shed additional light on the vessels' contents.

Archaeological Samples Analyzed. The earlier sample comes from a multichambered tomb (U-j) at Abydos on the middle Nile River in Upper Egypt (2, 13). Dated to the Naqada IIIa2 period (*ca.* 3150 B.C.) by radiocarbon determinations, the tomb was built in the desert and belongs to one of the first rulers of the country, Scorpion I of Dynasty 0, at the beginning of Egyptian dynastic history. Its contents were exceptionally rich and included some 700 jars of foreign type that were stacked high in 3 chambers.

In 1994, a sample of yellowish flaky residue from jar no. 156 (Fig. 1) was analyzed by FTIR spectrometry, HPLC, and a Feigl spot test for tartaric acid/tartrate (14). The residue represented the agglomerated remains of materials on the surface of a liquid that had gradually evaporated and left a ring or tide-line on the interior of the jar (see Fig. S1). The 3 independent methods gave results that pointed strongly to the presence of tartrate, a principal biomarker for wine and other grape products in the Middle East. The HPLC data supported the interpretation that a tree resin—very likely terebinth—had been added to the vessel's contents.

The identification of tartrate, as the calcium salt, was based on

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[1]To whom correspondence should be addressed. E-mail: mcgovern@sas.upenn.edu.

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Fig. 1. Jar no. 115 [Hartung U, ed (2001) *Umm el-Qaab II: Importkeramik aus dem Friedhof U in Abydos (Umm el-Qaab) und die Beziehungen ägyptens zu Vorderasien im 4. Jahrtausend v. Chr.* (P. von Zabern, Mainz, Germany): cat. no. 156, pls. 25 and 79:156] from chamber 10 of the Scorpion I tomb. Swirling "tiger-stripes" in red paint and the form of this narrow-mouthed jar are paralleled by southern Levantine vessels of the same period (Early Bronze I, *ca.* 3300–3000 B.C.); the manufacture of the vessel in this region was borne out by instrumental neutron activation analysis (INAA). The jar contained a yellowish flaky residue, which was analyzed by multiple chemical techniques, and several grape pips. Height: 31.7 cm. Drawing courtesy of German Archaeological Institute in Cairo.

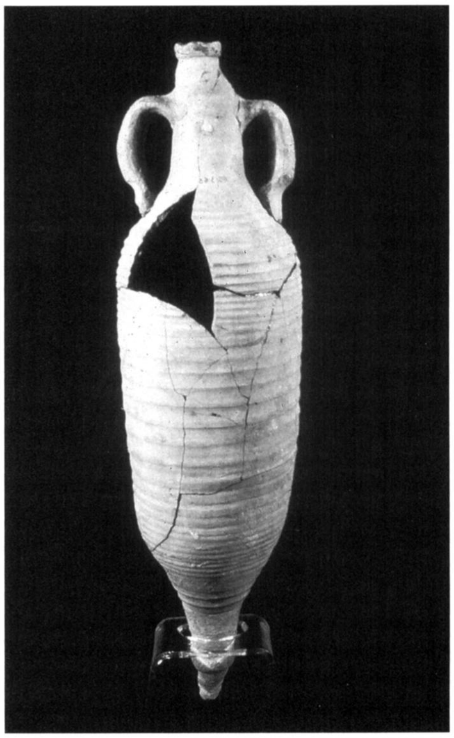

Fig. 2. Wine amphora from tomb 217 of cemetery 4 at Gebel Adda (Egypt), dated to early Byzantine times (the Ballana period of Lower Nubia, fourth to early sixth century A.D.). Height: 67.3 cm. With permission of the Royal Ontario Museum; photograph courtesy of W. Pratt (museum no. 973.24.1217).

the 3 methods independently agreeing with one another. If a single test result had proven negative, that would have invalidated the identification of calcium tartrate by the other methods. Although mixtures of compounds can be equivocal for IR and HPLC UV spectra, these were deconvoluted by statistical methods and scrutinized for the presence or absence of key absorptions. If a known absorption for a compound was lacking, that compound was excluded as a possibility. The IR and UV spectra of the Abydos sample were also searched for "matches" against large databases of relevant natural products and processed organic materials, synthetic compounds, modern wine samples, and "ancient wine reference samples." The latter were residues from ancient vessels that likely originally contained wine, based on strong archaeological criteria or exterior inscriptions that recorded their contents.

Once calcium tartrate was identified to a high level of probability in the residue, archaeological and enological considerations come into play in determining whether the intended grape product was wine and not grape juice, syrup, or vinegar. A syrup, produced by heating grape juice and concentrating it down, was unlikely, because its viscosity would have left a uniform coating of residue on the inside of the vessel. Instead, the residue was confined to the tide-line and the bottom of the vessel, where precipitates from a liquid accumulate. Minimally, the jar had contained grape juice.

Any grape juice, however, will naturally ferment to wine in several days in the warm climate of the Middle East. The identification of a 256-bp DNA segment of a larger 840-bp fragment belonging to a ribosomal sequence of the principal wine yeast, *Saccharomyces cerevisiae*, bore out this interpretation (15). Intentional fermentation to vinegar was unlikely because of the precautions that were taken to protect the liquid in this jar from oxygen by sealing its mouth and adding a tree resin with antioxidant properties.

Grape seeds from jar no. 156 provided further corroboration that the jars originally held a grape wine. Additionally, and bearing on the issue of additives to the wine, some jars (not including jar no. 156) yielded a single whole fig, which had been preserved by desiccation. It had been sliced, perhaps to assure greater surface contact for enhancing the wine's sweetness, taste, and other properties and to provide sufficient yeast for starting and sustaining the fermentation.

The second sample, a residue deposited on or intentionally applied to the interior of an amphora (Fig. 2) from Lower Nubia in southern Egypt, dates more than 3,500 years later than the Abydos jar and represents a terminal phase of Egyptian winemaking before the Islamic conquest. Belonging to the fourth to early sixth century A.D. (Ballana period), the amphora was recovered from a tomb at Gebel Adda (16). Based on its form and an inscription on its shoulder, it has been identified as a wine jar (N.B. Millet, personal communication, 1989). Numerous such vessels littered the ground around taverns in Nubian villages of the period, demonstrating how wine had gone from being an elite beverage in Pharaonic times to becoming a beverage of commoners, who were also buried with it.

In our 1990 pioneering study of ancient Near Eastern wine (16), the Gebel Adda residue provided an ancient wine reference sample for detecting tartaric acid/tartrate and other wine constituents. As a known wine residue from antiquity, which had undergone aging processes, its composition served to assess whether other less definitive vessels, such as Abydos jar no. 156, once held grape wine. Modern reference samples of tartaric acid/tartrate and other wine constituents provided additional controls.

As expected, the Gebel Adda residue tested positive for tartaric acid/tartrate according to the 3 methods. Its FTIR spectometry spectrum also showed the characteristic and very specific absorptions for tartaric acid and a tartrate salt by location, shape, relative intensity, and multiplicity. These results were directly comparable to the residue in Abydos jar no. 156, except that the latter's FTIR spectrometry spectrum lacked the sharp intense carbonyl peak of the acid, with a shoulder, at 1,720–1,740 cm^{-1}. In other words, although the tartaric acid in the Abydos jar had been converted wholly to the calcium salt, the younger Gebel Adda residue still retained the acid.

Another important inference could be drawn from the FTIR spectrometry spectra: other unidentified hydrocarbon-rich com-

pounds must be present in the 2 ancient samples because of intense peaks around 2,900 cm^{-1} and many additional subsidiary absorptions in the "fingerprint region" from 1,550–800 cm^{-1} that were not attributable to tartaric acid/tartrate. Some of these components were later identified as probable tree resin compounds in the Abydos sample by HPLC, using a UV detector. This method, not yet available to us when the Gebel Adda sample was analyzed, has been very useful in our ongoing analytical program because it enables chromatographic separation and more precise chemical identifications. Together with GC/MS, these techniques have enabled us to substantiate our earlier finding that tree resins, both pine and terebinth, were often added to ancient wines.

Between 1990 and the present, many more samples from putative ancient wine jars have been analyzed, ranging in date from *ca.* 5400 B.C. through the Byzantine period and from sites throughout the Middle East and Greece (2, 17). A group of 9 samples from Pharaoh Amenhotep III's palace of Malkata (18), dated midway (*ca.* 1390–1350 B.C.) between the Abydos and Gebel Adda samples, is especially important in providing another set of ancient wine reference samples and additional evidence for resinated wine from this country. The analyzed amphorae bore black-inked inscriptions on their shoulders, which read like a modern wine label, providing the year of the pharaoh when the wine had been made, the name and location of the estate in the Nile Delta, the name of the winemaker, and even quality notes. Our chemical results from these samples, attesting to a resinated wine, were closely comparable to those for the Abydos and Gebel Adda jars.

Even when the archaeological, inscriptional, and chemical evidence are as congruent as they are for the Abydos, Malkata, and Gebel Adda samples, one can remain skeptical. As is generally true of historical sciences, the identification of any ancient natural product is limited by the database and the impossibility of replicating past events. An archaeologist might ask for samples from better archaeological contexts, question whether a particular vessel type was intended for wine, and propose alternative interpretations of the available evidence. A chemist will want ever-more definitive identifications of tartaric acid/tartrate and the tree resin compounds as chemical instrumentation is improved.

Liquid Chromatography Tandem Mass Spectrometry Analyses. A major breakthrough in the detection of tartaric acid/tartrate was recently achieved by University of Barcelona researchers (19). Using liquid chromatography tandem mass spectrometry (LC/MS/MS), they analyzed ancient wine reference samples from Old and New Kingdom Egyptian wine vessels, *viz.*, (*i*) a jar from the tomb of Pharaoh Semerkhet of Dynasty 1, who reigned about 150 years after Scorpion I, near the establishment of the royal winemaking industry in the Nile Delta; (*ii*) an amphora from the tomb of Pharaoh Tutankhamun, who reigned shortly after Amenhotep III; and (*iii*) an amphora said to contain wine from the Nile Delta of approximately the same date as the Tutankhamun amphora or somewhat later in early Dynasty 19.

The Barcelona study left little doubt that tartaric acid/tartrate was preserved intact in ancient Egyptian jars, whether as an adherent residue or absorbed into the pottery fabric and held by polar clay constituents. It is unequivocally identified by using the multiple reaction monitoring (MRM) mode of the LC/MS/MS (Fig. 3). In brief, tartaric acid (M_r = 150.1) is ionized when it comes off an LC column at a specific time in the first cell of the quadrupole mass spectrometer, where it is mass-filtered. The deprotonated molecular ion is then fragmented in a collision cell, and the daughter ions are again filtered by a second quadrupole. Tartaric acid is identified based on discrete fragmentation products that are produced and detected.

In our ongoing collaboration to develop biomolecular archaeological techniques with the Scientific Services Division of the Tax and Trade Bureau, the primary government laboratory for the analysis of alcoholic beverages in the United States, we decided first

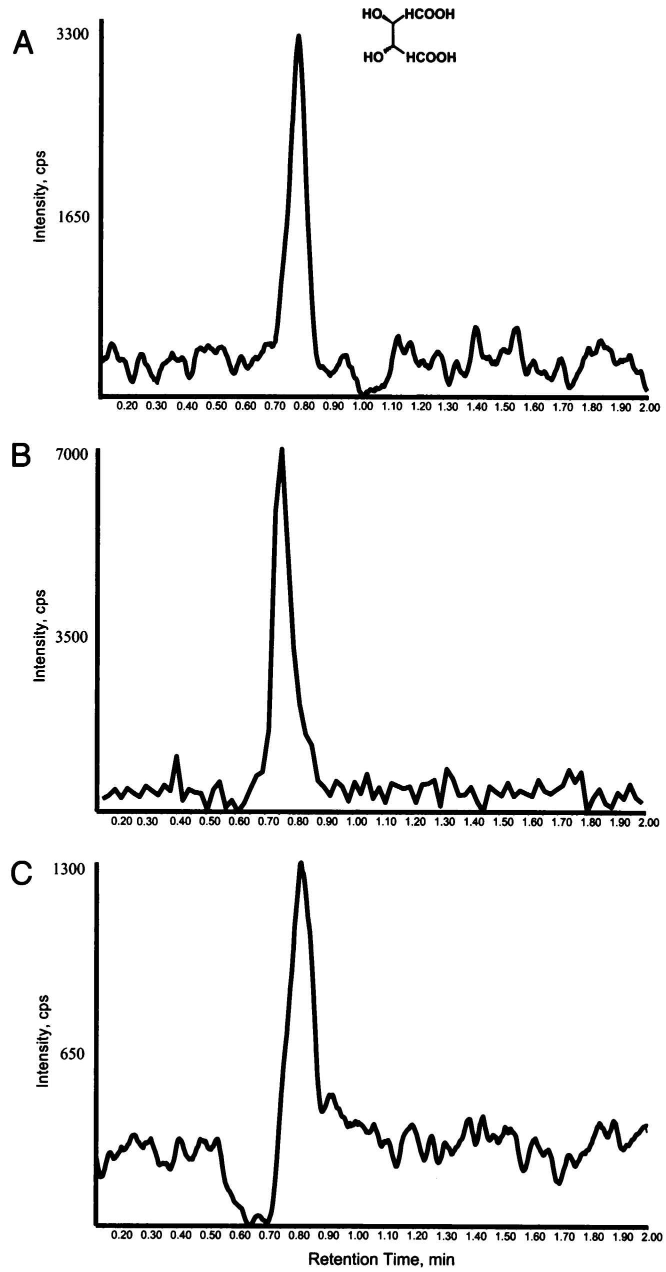

Fig. 3. MRM LC/MS/MS traces of L-tartaric acid. (*A*) Standard solution corresponding to *m/z* 149→87 molecular ion fragmentation. (*B* and *C*) Chromatograms for the aqueous extracts of the ancient Gebel Adda (Fig. 2) and Abydos (Fig. 1) samples, respectively.

to reanalyze the Abydos and Gebel Adda samples by LC/MS/MS. The methodological issue was clearcut: was tartaric acid/tartrate, in fact, present in these samples—one from a relatively late wine amphora representing an ancient wine reference sample and the other from a much more ancient jar with few clues of its original contents? If so, our earlier conclusions, based on 3 less precise methods and general archaeological considerations, would be greatly strengthened. The samples had been stored under climate-controlled conditions in the dark in the interim.

Our LC/MS/MS analyses of the 2 samples followed the general methodology of Guasch-Jané et al. (19), with some modifications. The monitored MRM *m/z* 149→87 transition corresponds to the loss of COOH and OH fragments of the $[M\text{-}H]^-$ molecule of tartaric acid. As can be seen in Fig. 3, both the Abydos and Gebel Adda

samples gave peaks for tartaric acid at a retention time of 0.75 min, which matched a 0.1-μg/mL (0.1 ppm) standard of tartaric acid. The results of analyses on similar extracts of an ancient pottery blank and aqueous controls, run before and after each analysis, were negative (data not shown). An ancient bowl rim from a site in Jordan (Tell el-Fukhar, Late Bronze II, *ca.* 1400–1200 B.C., no. 763) served as the pottery blank. It had been made of local clay according to instrumental neutron activation analysis (INAA) (20) and had a very low probability of having originally contained wine or another grape product.

Headspace Solid Phase Microextraction and Thermal Desorption GC/MS Analyses

Having confirmed tartaric acid/tartrate by LC/MS/MS in the Abydos and Gebel Adda samples, we then analyzed them by headspace solid phase microextraction (SPME) and thermal desorption (TD) GC/MS. The goal was to discover whether the Egyptian wines contained any plant additives, which had been implied by our earlier analyses.

Headspace SPME and TD GC/MS have great utility in biomolecular archaeology because of their high sensitivity and selectivity for volatile compounds of interest (8, 21). SPME extraction efficiency and sensitivity are considerably increased by dissolving or suspending the solid sample in an aqueous saline solution. Moreover, the methods require only milligram quantities of valuable archaeological samples, and analyses can be performed rapidly without extraction in an organic solvent.

Compounds were identified in the Abydos and Gebel Adda samples (Table S1) by retention time and/or matches to a mass spectral library of more than 160,000 samples (NIST05). Illustrative SPME experimental data are provided in Figs. S2 and S3.

Compounds detected in the ancient pottery blank are assumed to derive either from ancient and/or modern "background contaminants," attributable to groundwater percolation or sample handling (e.g., plasticizers and antioxidants from plastic, including compounds in the phthalate family and 3,5-di-tert-butyl-4-hydroxybenzaldehyde). Possibly, some of the low-boiling compounds up to hexenal were also contaminants; however, it is more likely that they were preserved within the ionic clay structure. Any ancient ethanol would have been metabolized by microorganisms.

A thorough search of the chemical literature [using SciFinder Scholar of the Chemical Abstract Services, American Chemical Society; Dr. Duke's Phytochemical and Ethnobotanical Databases (http://www.ars-grin.gov/duke/) of the U.S. Department of Agriculture, Agricultural Research Service; the chemical database of the Amber Research Laboratory of Vassar College (http://cima.ng-london.org.uk/arl/); and other bioinformatics tools (22)] enabled several groups of probable ancient compounds to be distinguished in the Abydos and Gebel Adda samples.

As might be anticipated for samples that tested positive for tartaric acid/tartrate, constituents of modern grape wine (23) are very well represented in one or both of the ancient samples, including alcohols, acids, esters, aldehydes, fatty acid derivatives, and terpenoids. Although benzaldehyde, 2-ethyl-1-hexanol, nonanal, and ethyl palmitate occur in wine, they might also be contaminants. Excellent preservation of the more ancient Abydos sample, in particular, is implied by these findings.

For the Abydos sample, 3 herbs—savory (*Satureja*), *Artemisia seibeni* (a member of the wormwood family), and blue tansy (*Tanacetum annuum*)—could account for the combined presence of 8 terpenoid compounds (labeled 2 in Table S1): linalool, camphor, borneol, L-menthol, alpha-terpineol, carvone, thymol, and geranyl acetone. The same compounds, except for geranyl acetone, occur in an additional 7 herbal genera, including balm (*Melissa*), senna (*Cassia*), coriander (*Coriandrum*), germander (*Teucrium*), mint (*Mentha*), sage (*Salvia*), and thyme (*Thymus/Thymbra*).

It may be significant that only *Satureja*, *Cassia*, and *Salvia* are possibly native to Egypt. Because *A. seibeni* and *T. annuum* are probably native to Iran and Morocco, respectively, they are unlikely to have been traded or transplanted to Egypt at this early date. Of the remaining 7 plants, all are arguably native to the southern Levant (24) (for coriander, see ref. 25). Today, they grow in the vicinity of the areas where the Abydos wine was made according to the INAA results (26), *viz.*, the Jordan Valley, the uplands to its east and west, and the Mediterranean littoral near Gaza.

For the Gebel Adda sample, only rosemary (*Rosmarinus officinialis*), a member of the mint family (Lamiaceae or Labiatae), could explain fenchone, camphor, borneol, cuminaldehyde, and vanillin (labeled 3 in Table S1). Rosemary, which can tolerate relatively dry conditions, grows both in the southern Levant and Egypt (27).

As yet, unique biomarkers for the herbs that might have been added to the Abydos and Gebel Adda wines have not been delimited. Moreover, many of the compounds that we identified are found in other plants and herbs of the eastern Mediterranean region. For example, camphor, borneol, carvone, and thymol are reported in yarrow (*Achillea*); the same compounds, with the exception of borneol, in wild fennel (*Foeniculum vulgare*); linalool and thymol in marjoram; and only borneol in oregano. Two herbs of Egyptian origin should also be noted: *Ambrosia maritima* contains camphor and carvone and *Conyza dioscorides* has camphor and linalool. Linalool, alpha-terpineol, and geranyl acetone also occur in grape wine, and camphor and borneol are found in pine resin, in addition to rosemary and many other herbs. Thus, although many different permutations of the detected compounds deriving from various natural products might be proposed, the most straightforward and simplest explanation is that one or more of the herbs, which can account for the greatest number of relatively rare compounds in the Abydos and Gebel Adda samples, were the likely additives to the wines.

Both ancient samples also contained compounds found in pine resin (labeled 4 in Table S1). Our previous HPLC results for the Abydos sample had already pointed to a tree resin additive, which we had tentatively identified as terebinth. However, a diterpenoid compound specific to pine—retene, an oxidative product of abietic acid (17)—was observed by TD GC/MS. Conventional GC/MS analysis of the Abydos sample also revealed the presence of additional oxidative products of the acid, *viz.*, dehydroabietatic acid and 7-oxodehydroabietic acid. Triterpenoids characteristic of terebinth resin (28) were absent.

The Gebel Adda sample had not been analyzed for tree resins in our initial study. In addition to retene, methyl dehydroabietate was detected by SPME and TD GC/MS. Methyl dehydroabietate (Fig. S4) points to the pine resin having been processed by heat to the tar, which is consistent with the entire interior of the amphora having been lined with a dark coating as a sealant.

Discussion and Conclusions

By employing LC/MS/MS to analyze the Abydos and Gebel Adda samples, 2 Egyptian samples separated in time by over 3,500 years, we have confirmed our earlier methodology for identifying tartaric acid/tartrate, the key biomarker for wine and grape products. By demonstrating that 3 independent techniques—FTIR spectrometry, HPLC, and a Feigl spot test—attested to the presence of tartaric acid/tartrate in the ancient samples and by making statistical comparisons with large IR and UV databases of ancient wine reference samples for wine and modern standards, we were reasonably confident that our results would hold up. Moreover, archaeological considerations—admittedly at a lower level of probability—supported a "wine hypothesis" as best accounting for the available evidence.

Certainly, a wine hypothesis stands or falls on whether tartaric acid/tartrate can be detected in the ancient residues. As analytical instrumentation improves, chemists and archaeologists alike

should continually test previous results, cull out any "false-positives," and generate data as they are made available by excavation or analytical techniques. Our analyses of the Abydos and Gebel Adda samples provide an illustrative example of how this can be accomplished in the constantly evolving field of biomolecular archaeology.

The reanalysis of the Abydos and Gebel Adda samples by SPME and TD GC/MS had another welcome unintended consequence in addition to confirming the presence of tartaric acid/tartrate. These sensitive versatile techniques enabled us to make a start on the chemical detection of ancient Egyptian herbal medicines. Much work remains to be done in refining and substantiating such findings, but ancient wine and other alcoholic beverages are known to be an excellent means to dissolve and administer herbal concoctions externally and internally (29). Indeed, before modern synthetic medicines became available, alcoholic beverages were the universal palliative.

Chemical analysis opens a door onto early Egyptian pharmacology by providing contemporaneous data of plant additives in ancient alcoholic beverages. In particular, adding a tree resin to wine, principally to protect against wine disease as already noted, was one of the most popular and widespread practices throughout the ancient world. Resinated wines were still being made in the Middle Ages according to the extensive agricultural and medical compilations based on classical writings collectively known as the *Geoponica* (e.g., ref. 30). An appreciation for the medicinal value of tree resins was not restricted to the Middle East and Mediterranean. In the Yellow River valley of China, probable resins of China fir, in the Elemi family of fragrant trees, and other native species were added to fermented beverages made from rice, millet, and fruits as early as 7000 B.C., according to multiple analyses by FTIR spectrometry, GC/MS, LC/MS, isotope analysis, and spot tests (8).

Until now, textual sources, in particular a series of medical papyri, have provided the primary evidence for the ancient Egyptian *materia medica*, which was renowned in the ancient world (11, 12, 31). The majority of the papyri belong to the New Kingdom, including the longest one, the 108-page Ebers papyrus, dated to *ca.* 1550 B.C. Several papyri have been dated as early as the mid-12th Dynasty, *ca.* 1850 B.C., and the Egyptian word for "physician" (*swnw*), which involved diagnosing disease and often included treatment with herbal remedies, occurs as early as Dynasty 3, *ca.* 2650 B.C. (12). A later tradition, which is not independently supported, states that Djer, the second pharaoh of Dynasty 1, was also a *swnw* (12); this is an intriguing possibility that may relate to the chemical findings from tomb U-j, because Djer ruled shortly after Scorpion I, *ca.* 3100 B.C., and his tomb at Abydos is close to U-j.

The prescriptions in the papyri, numbering more than 1,000, present a detailed picture of the ancient Egyptian pharmacopeia, even if more than 80% of some 160 hieroglyphic plant names defy translation. Many vegetables and fruits, including garlic, onion, celery, *Cyperus* grass tubers, watermelon, fig, moringa, persea, and zizyphus, for example, figure prominently as ingredients in the formulations; however, by far the most numerous are alcoholic beverages (wine and beer), tree resins (e.g., terebinth, pine, frankincense, myrrh, fir), and herbs of all kinds (e.g., bryony, coriander, cumin, mandrake, dill, aloe, wormwood). These plants and their exudates are described as being macerated; mixed together; steeped as a decoction or infusion in wine or vinegar, beer, honey, milk, oil, and/or water; strained; and administered for specific ailments (e.g., laxatives, emollients, expectorants, anthelmintics, analgesics, diuretics, aphrodisiacs). Many of the ingredients are still part of the herbal medical tradition of modern Egypt.

Among the most probable herbal additives to the Abydos wine, only coriander is known by its ancient Egyptian name (*š3w*). Eight baskets (half a liter) of coriander mericarp in the tomb of Tutankhamun underline its importance in ancient Egyptian culture and medicine (32). Coriander is explicitly listed in several medical prescriptions (11). Thus, stomach problems called for drinking a beer mixed with this herb, bryony, flax, and dates. For the treatment of blood in the stool, it was to be grated and mixed with chaste-tree and another unidentified fruit, infused into beer, strained, and drunk. For treating herpes, an external salve was prepared from coriander seeds, myrrh, and fermented honey.

The other herbal additive possibilities for the Abydos wine—balm, senna, germander, mint, sage, savory, and thyme—are yet to be certainly identified by their Egyptian names, although more intensive linguistic study promises their elucidation. For example, quite possibly, *'k3y* in a recipe for *kyphi* (11), a well-known temple fumigant and beverage additive, is to be translated as "mint." According to inscriptions in the late first millennium B.C. temples at Edfu and Philae, *kyphi* was prepared by grinding and sieving equal amounts of sweet flag (*Acorus calamus*), aromatic rush (*Andropogon schoenanthus*), terebinth resin, cassia, mint, and possibly *aspalathus*. This powder was then combined with separately prepared concoctions of wine with juniper berries, *Cyperus* and other plants, raisins and wine, and frankincense and honey. The addition of finely ground myrrh completed the recipe.

This literary attestation of an ancient Egyptian resinated herbal wine has only been partly borne out by our analysis of the Abydos sample, because, apart from the wine itself and possibly mint, the other plant components of *kyphi* were not chemically attested. We are not arguing that *kyphi*, per se, had been developed and used as early as 3150 B.C. Rather, our contention is that plant additives, including various herbs and tree resins, were already being dispensed via alcoholic beverages millennia earlier than the Edfu and Philae temple inscriptions.

The most probable herbal additives to the Abydos wine, on current evidence, share another important feature in common: nearly all were domesticated or cultivated in the southern Levant in advance of their introduction into Egypt (33). This circumstance is in accord with the wine in the Abydos jars having most likely been made in this region. Beginning *ca.* 3000 B.C., as the domesticated grapevine was transplanted to the Nile Delta, one may reasonably hypothesize that some southern Levantine herbs accompanied or soon followed it into the gardens and fields of the country. These developments considerably expanded the Egyptian pharmacopeia.

Other researchers have begun to report botanical and chemical evidence for herbal concoctions in alcoholic beverages. From about the same time as the Abydos wine, native rosemary and mint, together with thyme, were added to a fermented emmer wheat-barley beverage at Genó in Spain (34). Wild rosemary was also an ingredient, along with bog myrtle, yarrow, and other herbs, in gruit, the principal bittering agent in early medieval European beer (35).

Other archaeochemical and archaeobotanical evidence for rosemary is of special interest, because only this herb had a high probability of having been added to the Gebel Adda resinated wine. Unfortunately, the ancient Egyptian word for the herb is unknown; thus, its place in Egyptian medicine cannot be tracked. It is known that rosemary was a popular food flavorant in Roman and Byzantine times (36) when the Gebel Adda resinated wine was produced. Moreover, it contains numerous antioxidant compounds (e.g., rosmarinic acid, carnosol) that have potentially wide-ranging medical benefits (37–38).

Although much remains to be discovered about ancient Egyptian herbal wines, our chemical findings from Abydos and Gebel Adda, together with the results from Malkata, attest to their great antiquity and importance from the country's initial unification under the pharaohs and continuing for millennia.

Further refinements in analytical techniques will undoubtedly reveal other important compounds in ancient wines. For example, the Gebel Adda sample was recently analyzed by Fourier-transform ion cyclotron resonance/MS. Signals consistent with the structure of resveratrol, the well-known antioxidant that has anticancer effects and has been shown to extend life in many organisms, were detected. Follow-up confirmatory studies by ultraperformance

liquid chromatography/MS are now being carried out (P. Schmitt-Kopplin, R. Gougeon, personal communication, 2009).

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Man and Plants against Pain

Man and Plants Against Pain[1]

NORMAN GROVER[2]

Our earliest known records refer to banal occurrences: taxes, sports, weather, illness. A disproportionate number of these manuscripts refer to illness and pain. Ignorant though they seem now to have been, ancient peoples occasionally stumbled upon ways to allay pain—and it was often recorded. Nearly all effective pain-relievers discovered by man up to the beginning of the 20th century were of botanical origin. Today, the synthetic analgesics and anesthetics have markedly decreased the importance of botanical preparations, but some remain of unchallenged superiority. This article describes some of these plants and products of past and present importance in combatting pain and attempts to indicate where research may reward us with new botanical analgesics.

Alcohol

The use of alcoholic beverages has paralleled the history of mankind. Alcohol has found a place in social life, religious rites and medical practice. Despite its ancient history and near universal usage, alcohol is rarely a naturally occurring plant product; rather, it is obtained by fermentation, the transformation of sugar into alcohol by various yeasts. Thus, the production of alcohol always involves two plant species: the sugar-containing species and the yeast. Since malting converts starch to sugar, an even larger number of plants is thereby available for the production of alcohol.

Medicinally, alcohol has had many and varied uses, nearly all of them having passed out of favor. Among these was the taking of liquor for anesthesia. When this practice arose is unknown; all evidence seems to indicate that drinking alcohol to excess (to produce anesthesia) is as old as the practice of drinking itself. Likewise, no one geographical region can be pointed out as the original home of the custom. Starch- and sugar-containing species are so widely scattered taxonomically and geographically that the consumption of alcoholic beverages must have arisen independently in sundry parts of the world. The colloquial usage of the expression "to feel no pain" as a synonym for "to be intoxicated" is evidence that contemporary society is well acquainted with the anesthetic effects of alcohol; and current anthropological literature makes it quite evident that primitive societies are equally cognizant of it. The scarcity of documented accounts of primitive "medicine men" using alcohol to relieve the pain of surgery may attest not to their unawareness of alcohol's anesthetic properties but to the backwardness of primitive surgery.

Depending on the quantity ingested, alcohol acts first as an excitant, then as a sedative, hypnotic, analgesic and anesthetic. The effect of alcohol is, therefore, similar to that of ether and other anesthetics now in wide usage. The question then arises: Why has the use of alcohol as an anesthetic been abandoned? Like many of the other general anesthetics, alcohol is a poison if ingested in large quantities, and there is but slight difference between an anesthetic and a lethal dose of alcohol. Alcohol also takes an inconveniently long time before producing anesthesia, and, once an unconscious state has been reached, the patient may be on the verge of respiratory collapse and death. Ether, on the other hand, produces unconsciousness long before a lethal amount is approached. Alcohol has, consequently, been largely abandoned in medicine; but in the absence of competent medical aid, alcohol still remains a widely used home remedy for the alleviation of pain, until professional medical help can be procured.

The Mandrake

The mandrake, or mandragora, *Mandragora officinarum* (Solanaceae) has also been

[1] Prepared as a result of research in Biology 40 at Harvard College in 1960, under Dr. R. E. Schultes.

[2] 26, Houston Avenue, Milton, Mass.

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dropped from medical use, notwithstanding its proven pain-relieving properties. The derivation of the name is in doubt; some believe that it is derived from the Sanskrit "mandros" (sleep) and "agora" (substance); others hold it to be due to the resemblance of the forked root to male genitalia (whence mandrake). The ancients also had "woman-drakes" as common as mandrakes.

The early literature of the Mediterranean area (where the mandrake is native) abounds in references to the "mystical" properties of the little plant. One of the earliest recorded references occurs in Genesis XXX. Rachel ate mandrakes found by Reuben, and they supposedly aided her in conceiving Joseph. The Egyptians, Assyrians, and Persians all have left records of "male plants," used usually as aphrodisiacs; but there is sharp disagreement whether or not these plants were actually *Mandragora officinarum*. The Greeks were undeniably aware of the narcotic properties of this species and apparently employed it as an intoxicant more than for magical purposes. Hippocrates asserted that "a small dose in wine, less than would occasion delirium, will relieve the deepest depression and anxiety." But even if the Greeks were amongst the first to use the plant for legitimate purposes, they also added to the aura of mystery surrounding it; for Theophrastus, in his "History of Plants" (about 230 B.C.), first mentioned the rites and ceremonies associated with gathering the mandrake.

The Romans inherited both the glory and the superstitions of the Greeks. Pliny translated the Greek herbals into Latin, adding some embellishments of his own. By Pliny's time, it was extremely hazardous business to gain possession of a mandrake. One had to stand with his back to the wind, draw three mystic circles about the plant with the point of a sword, turn toward the west, and then, and only then, could one safely dig up the man-plant.

By medieval times, the danger of uprooting a mandrake had become even more extreme. The herb had by then acquired the power of speech, and as it was torn from the ground, it emitted such terrible shrieks that it immediately turned the collector into a madman. But, just as the mind can conceive such horrors, so can it conceive a method of overcoming them. The scheme: the earth about the mandrake was loosened, and the collector then placed wax in his ears. Immediately thereafter, the collector fastened a dog's tail to the plant and offered the dog a piece of bread. In rapid succession, the dog jumped, the mandrake screamed and was torn loose, and the dog died.

Fortunately, however, the use of mandrake as a pain reliever arose and flourished along with this superstition. Dioscorides first mentioned the use of mandrake as an anesthetic, recommending the "wine of mandrake to be given to such as shall be cut or cauterized." By the 6th century, this use of the mandrake was relatively well known. Isidorus wrote: "Its bark is given in wine to those who are about to be surgically operated upon, that they may fall into a stupor and may not feel the pain." And Serapion, writing in the 9th century, stated: "A measure of four obols is given to drink to a person when it is necessary to cauterize or cut. He will not feel the cauterizing or cutting because of the stupor which ensues."

Mandrake continued to be employed as an anesthetic to the 16th century, when writers of the great herbals began to deride the old traditions. Two reasons, both apparently valid, account for the little notice given the drug from that time to the late 19th century. First, better pain relievers were becoming available; secondly, the plant was so thoroughly linked to superstition that medicine, surgery, and pharmacy simply abandoned it in their quest for respectability.

In 1888, B. W. Richardson undertook the first modern investigations of the chemical substances in the plant and, in 1889, Ahrens isolated the alkaloid "mandragorine" from the root. Twelve years later, mandragorine was shown to be a mixture of hyoscyamine and hyoscine (scopolamine) with several other alkaloids. These constituents are the same as those from *Atropa Belladonna, Hyoscyamus niger,* and *Datura Stramonium* which today are so important in medicine. The mandrake has fallen into disuse because of these more readily available sources of its alkaloids.

The Opium Poppy

The opium poppy has been utilized by man from very early times. There are sev-

eral varieties of *Papaver somniferum* (Papaveraceae), one of which (var. *setigerum*) still grows wild in the countries bordering the northern coast of the Mediterranean—though it is by no means certain that the plant originated there. The centers of cultivation are, however, Asia Minor and the Far East, Turkey being the chief supplier of medicinal opium. Other countries figure prominently in opium production as well: Bulgaria, Yugoslavia, Iran, India, China.

Nearly all parts of the plant contain a white milky latex from which the alkaloids are isolated; by far the greatest concentration of latex occurs in the capsules. Inasmuch as the quantity of latex decreases as the fruit matures, collection is initiated usually before the fruit ripens. The collection procedure varies from place to place, but the general technique is more or less constant.

In the early morning or late afternoon when the temperature is low, collectors, with special knives, make several incisions in each capsule, taking care not to cut through the inner wall, in order not to injure the seeds or lose any of the latex. The latex exudes from the severed latex vessels to form brownish cakes which are then taken to a central collecting area and kneaded by hand into a uniform consistency. The hardened latex is then wrapped in leaves and dried in the sun before shipment to commercial buyers.

According to the earliest records, the latex was used to induce analgesia. In this procedure, there lay great danger. We know now that individual reaction to drugs varies; compounded with this was the variation of alkaloid concentration from plant to plant and consequently from one unit of latex to another. The early medical practitioner quickly learned that a given amount of latex might not relieve pain in one case, whereas in another it might well cause deep coma, or even death.

The Ebers Papyrus contains a reference to the opium poppy, but apparently there is no reason to believe that the Egyptians used opium to relieve pain in surgery. The Greeks knew of opium at least as early as 400 B.C., but they used it sparingly. Opium was one of the constituents in Theodoric's "narcotic sponge" of the 13th century, but it was not until the 16th century, when Paracelsus invented laudanum, that the "modern" history of opium really began. Paracelsus' laudanum contained such expensive ingredients as gold and pearls, as well as opium. Laudanum is still in use, but the term is applied only to a tincture of opium.

In 1806, T. W. Sertürner isolated the active ingredient of opium latex. He had tried repeatedly to crystallize the principal, to no avail. One day, after pouring liquid ammonia over the opium, he noticed crystals that he had never seen before. Assuming that these crystals represented the active ingredient, Sertürner was faced with the problem of finding "guinea pigs." First he salted cheese with the crystals and observed the effect on mice. They died. Then he used dogs. Putting the crystals this time into bones, he found that the crystals "made the dogs happy." The time was near for experiments on human beings. He took the crystals himself and had his coterie of friends assist. Sertürner was unconscious for ten hours, having taken twice the amount that is now considered a maximum dose. In fact, however, Sertürner was driven out of his home town of Inbeck as a "quack" and a fraud; but he had succeeded in isolating morphine.

In addition to morphine, the opium poppy contains more than 25 other alkaloids, including codeine which acts more effectively on the "cough center" but less effectively on that area of the brain that senses pain. Morphine itself has virtually no local action; it is not absorbed through the skin, and so its use as a dusting powder is impractical. Although rapidly absorbed through the mucous membranes, it is commonly given by injection. Precisely how morphine acts on the brain is not yet known, though it has been hypothesized that it disrupts "association areas." From subjective reports, we know that mild doses do not abolish pain; the pain is felt but not appreciated. Thus, morphine disrupts the process of assigning affect to pain. Increased doses produce unconsciousness and, consequently, complete relief from pain.

Without a doubt, morphine is today the most widely used analgesic of botanical origin. In cases of accidental trauma (except in

skull fractures or certain internal injuries, where it may mask symptoms) morphine is *the* universally accepted pain-reliever. In addition to its use in accidents, morphine is employed as a pre-operative and post-operative sedative. First tried for this purpose as early as 1850, it did not come into general use until the early 20th century. In 1899, morphine was tried in combination with scopolamine to induce "twilight sleep" for surgery and childbirth. Today, the gaseous anesthetics have replaced morphine for surgical anesthesia, except in certain "poor risk cases" where the side effects of morphine are preferable to those of ether, cyclopropane and the like.

Drugs of the Belladonna Series

The "belladonna series" is a group of drugs—all with similar physiological action—from a group of botanically closely related genera of the Solanaceae. The plants of principal importance are *Atropa Belladonna, Datura meteloides, Datura Stramonium, and Hyoscyamus niger.* Each of these plants had, of course, its own long and unique history, until chemistry and pharmacy united their stories in the field of medical therapeutics.

Belladonna is probably the most familiar name in the list, although there is really no single drug by that name. Like so many other solanaceous plants, *Atropa Belladonna* contains many alkaloids: mostly atropine, hyoscyamine, apoatropine, and belladonnine. *Atropa Belladonna* is native to central and southern Europe and Asia Minor. "Atropa" is derived from the name of the Greek Fate, Atropos, "The Unalterable," who cut the thread of life. The toxicity of the berries may have given rise to this epithet, as well as to our common name "deadly nightshade." The name "belladonna" is of later origin. Matthiolus was the first to use "belladonna," meaning in Italian "beautiful lady," in reference to the use of the plant by Italian ladies of the Middle Ages to induce mydriasis and enhance their beauty. Today, this mydriatic property of atropine is valuable in ophthalmology. The plant was known both to Dioscorides and Theophrastus, but it was not until the 18th century that the alkaloids of *Atropa Belladonna* were employed extensively. The first "modern" reference to *Atropa* alkaloids occurred apparently in the *Pharmacopoeia Wurtembergica* (1st ed., 1764), in which the use of hydrobromide of scopolamine is recommended as a sedative.

The highest concentration of atropine is found in the metabolically most active cells. The roots would, therefore, give a better yield than the leaves; but apparently the producers prefer to obtain more than one harvest from each plant, and, therefore, leave the roots undisturbed. The precursors of atropine are produced in the roots and carried to all other parts of the plant. Rowson (69) showed this by grafting belladonna stems to tomato roots and making the reciprocal graft of tomato stems to belladonna roots. At maturity, he found alkaloids in the belladonna root-tomato stem plants only. The experimental technique was further corroborated in a series of belladonna-potato grafts. Atropine, peculiarly enough, does not occur in nature under normal conditions. What does occur is laevo-hyoscyamine, which, under chemical control, is racemized to atropine.

Atropine has both a central and a local action and is often used consequently as a component of "muscle plasters." It is absorbed through the skin and paralyzes the ends of the pain-conducting nerves. Atropine is likewise readily absorbed into the blood, which carries it throughout the body. Inasmuch as atropine acts on the ends of nearly all the secretory nerves, a local application of atropine may well cause undesirable side effects in areas quite distant from the site of application: arrest of salivation and sweating; cessation of gastric juice and milk production; blurred vision; tachycardia.

When taken internally, atropine acts directly upon the cerebrum, causing initial excitement followed by a prolonged state of sleepiness. It can, therefore, be used as a substitute for morphine, but morphine is the usual choice, since it does not cause initial excitement.

Datura is a widespread genus that has been and still is used on all the continents except Australia for its narcotic properties. *Datura Stramonium,* native prorably to the

region about the Caspian Sea, yields the drug stramonium. Known as early as 37 A.D., it is still a favorite source of "knockout drops" in the tropics. The name "stramonium" comes apparently from the French "stramoine" meaning stinkweed. The settlers at Jamestown, Virginia, apparently introduced the plant into the New World and attempted to use it as a "pot herb" with nearly fatal results. Thus arose the American name for the plant "Jamestown (Jimson) Weed." It yields atropine and can, therefore, substitute for *Atropa Belladonna* as a source of this alkaloid.

Datura meteloides, of American origin, has been used in Mexico and the American Southwest since earliest times as part of religious and magical rites. Ethnobotanical literature states that the Zuñi Indians of New Mexico used *D. Stramonium* as an anesthetic in breast operations (79) and that the Pueblo used it in heroic doses for surgery (29). Inasmuch as *D. Stramonium* is probably of Old World origin, these accounts may actually refer to *D. meteloides.* On the other hand, J. F. Dastur (22) reports the use of the American *D. meteloides* by the natives of India and Pakistan. These confused reports may possibly be due to the fact that the natives (and botanical writers on occasion) often do not distinguish between species of *Datura.*

The last plant of the series is *Hyoscyamus niger.* Its common names "henbane" and "mort aux poule" are derived from its supposed use by criminals to kill fowl. The earliest reference (2250 B.C.) to *Hyoscyamus* occurs on a Babylonian clay tablet, where the seeds (with gum mastic cement) are recommended for pain of dental caries. Dioscorides recommended its use in poultices, and through the centuries henbane has had periods of use followed by disuse. To obtain its alkaloidal constituents, atropine, hyoscyamine, and scopolamine, henbane leaves are gathered when the plant is in full flower and then carefully dried.

Interestingly enough, the history of scopolamine, one of the chief constituents of the belladonna series, is intertwined with the history of morphine. In 1889, Korff first described the use of morphine combined with scopolamine for "twilight sleep." Scopolamine itself does not alleviate pain; morphine relieves the pain, while scopolamine combats certain side effects of morphine. In 1902, twilight sleep was first used in childbirth, and initial reports seemed to indicate that the pain of child-bearing was at last reliably overcome. It was soon extensively employed; but disquieting reports began to accumulate. In many instances, labor was prolonged by the use of these drugs, and infant mortality was on the rise. Nearly as rapidly as it had been accepted, twilight sleep was abandoned. In 1921, there was a revival of interest in twilight sleep, but it was soon shown that increased infant mortality had not been eliminated. Twilight sleep was then again abandoned. Large doses of morphine-scopolamine have been used intermittently as a general anesthetic in surgical cases, but, by and large, the conventional inhalation anesthetics have superseded morphine-scopolamine.

The Hemp Plant

The hemp plant, *Cannabis sativa* (Moraceae) originated in some part of temperate Asia, where the earliest records that we have of it mention its use in medicine. As early as 1000 B.C., the Indian Susruta mentions "bhanga" as a remedy, and the character of the names by which it was designated in early Hindu literature indicates that it was employed for its euphoric properties. The biography of the Chinese physician Hoa-tho (about A.D. 220) mentioned "Ma-Yo," a hemp preparation which induced insensibility before amputation.

The fact that the ancients used a plant medicinally, however, is not a measure of its usefulness today. Analysis of the dried flowers or of the gum resin from wounds made on the stem and branches has shown the active ingredient to be cannabinol. The concentration of cannabinol varies greatly from plant to plant, even among those grown in the same area under virtually identical conditions. For this reason, it has been difficult to prepare standard extracts of the drug. Furthermore, the efficacy of the anesthetic effects of the drug has been questioned. Ethnologic and anthropologic reports from India are rich in references to the use of the smoke from the burned leaves for relieving

pain,[3] and hemp smokers occasionally report a deadened sense of pain as well as the usual distortion of time perception and loss of motor control.

A survey of medical literature indicates that very little research, if any, is currently being carried out on the drug, and several medical and pharmaceutical authorities indicate that it is no longer used in modern medicine, the reasons being its variability, the tendency of the drug to deteriorate and differences in individual susceptibility to its action. Cannabinol, nevertheless, can and does have an analgesic action. It has merely been abandoned for more reliable drugs. In 1930, it was stated in the *Journal of the American Medical Association* (**94**: 165) that

> "The sensation of pain is distinctly lessened or entirely absent and the sense of touch is less acute than normally. Hence a woman in labor may have a more or less painless labor. If a sufficient amount of the drug is taken, the patient may fall into a tranquil sleep from which she will awaken refreshed. . . . As far as is known, a baby born of a mother intoxicated with cannabis will not be abnormal in any way."

The Coca Plant

The last of the major botanical pain relievers is cocaine, an alkaloid obtained from the coca plant, *Erythroxylon Coca* (Erythroxylaceae). A shrub native to the Andes of Peru and unknown in Europe until the conquest of Peru, *E. Coca* was almost indispensable to the Indians; they would not work without a daily allotment of coca. The Spaniards did not adopt the native habit of chewing coca leaves. They considered it an idle indulgence, or worse, a nefarious tool of the devil to keep the Indians from the faith that Spain had brought them. But as soon as the Spaniards realized that the Indians ate less if they were given coca leaves, they quickly reversed their decision and allowed the Indians this indulgence—after putting a tax on the coca plant. We now know that the cocaine in the leaves paralyzes all sensory nerves, and is, therefore, a local anesthetic. It paralyzed the natives' nerves that convey hunger pangs, thereby allowing the natives to work without experiencing the usual discomforts of hunger.

It is the leaves that yield the alkaloid, cocaine. In the Huanaco or Bolivian coca, the leaves are short, greenish brown and petiolate. Native pickers gather the coca leaves in two harvests: usually in April and September. The leaves are dried in the sun, packed in sacks for local transport, and then transferred to metal containers for shipment abroad. By far the greatest amount of the drug is still consumed by the natives in their ancient custom of coca-chewing.

Because the coca-chewing habit dates from the beginning of recorded history in Peru and since the coca leaf can alleviate hunger pangs, students of medical history, anthropologists, and others have long wondered whether the pre-Incan and Incan civilizations used the coca leaf to relieve pain. It is by no means certain that the Incas or pre-Incas even knew of the anesthetic action of coca; but, there is some circumstantial evidence that has led anthropologists and pathologists to this conclusion. First, it is common practice today for the natives to place coca leaves in a wound before attempting any incisions in the general area. Whether this custom arose under the Incan civilization or whether it arose much later is not known; it may, however, be significant. Secondly, we know that the Incas were among the most advanced primitives in surgery. They have left behind surgical instruments, and their graves yield so many trephined skulls (nearly 5% of all skulls are trephined, some in as many as four different places, representing presumably four separate operations) that it is difficult to believe that such extensive surgery could have been done without an anesthetic. On the other hand, we know that in some areas (e.g., Algeria) trephining was done without anesthesia. Even if the Incas did employ anesthesia, they may have had recourse to alcoholic beverages to induce senselessness.

The third reason proposed—the incidence with which trephined skulls were buried with

[3] Normally, the effect is produced by having the sufferer smoke cigarettes or sit in a closed room where the plant is added to fire. But one account tells of an Indian physician who introduced smoke into the patient's anus to ease a colonic spasm of the largest intentine.

little sacks containing coca leaves—can also be disputed. Sacks of coca leaves were buried likewise with bodies with intact skulls. Perhaps a supply of coca was provided for use in after life. Until more precise records and evidence are found, the use of coca leaves as an anesthetic by the Incas will remain supposition, not fact.

That the natives failed to perceive the anesthetic value of coca extract does not imply that the "advanced" European was any more perspicacious. No matter which anesthetic or analgesic plant we consider, we see man's failure to grasp its significance, despite the great need for pain-relievers. The first scientific knowledge of the coca plant in Europe occurs in the writings of a physician of Seville, Nicholas Monardes, in 1565. His "Joyful Newes Out of the Newe Founde Worlde" consisted mainly of an enumeration and description of natural history of the Western Hemisphere. Among the plants described was *Erythroxylon Coca*. The first recorded medical use of coca in Europe was written by Father Blas Valera in 1609. The coca leaf was said to "preserve the body of many infirmities"; unfortunately, this vague description does not tell us whether the coca leaf was used for its anesthetic value or whether it was thought to possess therapeutic properties.

In 1735, Joseph de Jussieu, a member of La Condamine's expedition to South America, sent several specimens of coca to his brother, Antoine, in Paris, where they were preserved in the Museum of Natural History and became the standards for reference. The 18th century saw new attention turned towards the coca plant. Unfortunately, much of the material written about the plant was pseudo-medical, merely reiterating the presumed value of coca infusion as an elixir and tonic. These claims obscured the really important investigations, for when accurate scientific work was done, there was hesitation in accepting it because of the quackery already associated with the plant.

A truly important work on coca was a thesis by Albert Nieman, working under the auspices of the German chemist, Friedrich Wohler. Nieman isolated cocaine. Then placing cocaine crystals on his tongue, he discovered that they anesthetized it. Five years later, in 1864, Dr. Fauvil of Paris employed coca extract locally on the larynx. Dr. Morrell Mackenzie of England and Dr. Louis Eilsberg of the United States both had seen Fauvil operate with this anesthetic, and they introduced the anesthetic use of cocaine into their respective countries. There then occurred one of the most absurd periods in the history of anesthesia—that is the best way to describe it! Strangely enough, no general use was made of cocaine as an anesthetic for nearly a quarter of a century, despite the success experienced by these three eminent physicians.

In 1884, cocaine came to the attention of the Viennese physician, Carl Koller. It has been said that a student of Koller's accidentally applied cocaine to a friend's eye, discovering the resulting anesthesia. Perhaps this story is not entirely credible; nonetheless, Koller reported his success in painless eye-surgery to the German Ophthalmological Congress in 1884. His paper was hardly published when W. S. Halsted and R. J. Hall originated the principle of "nerve blocking." Then, in 1885, J. L. Corning of New York experimented with spinal anesthesia by giving cocaine hydrochloride to dogs and then to human beings. In 1892, Schleish demonstrated infiltration anesthesia by intracutaneous injection, and the various techniques of "local anesthesia" were well launched.

The techniques elaborated with the use of cocaine have persisted; the use of cocaine has not. Though undeniably effective in combatting pain, cocaine has several serious shortcomings. Its anesthetic index is low, not because of low potency but because of high toxicity. Its effects wear off rapidly, requiring repeated injections. Cocaine has undesirable irritant effects in addition to its toxicity. Finally, it cannot be sterilized, for boiling breaks down cocaine. In 1904, Alfred Einhorn synthesized a substance—novocaine—lacking these drawbacks. Many similar compounds followed in rapid succession, and these synthetics have gradually replaced cocaine. But the place of cocaine in the history of relief from pain will always be great.

Miscellaneous Plants

This section comprises a heterogeneous grouping of plants. 1) Some, though decidedly anesthetic, are little used. 2) Some,

though not anesthetic, were once employed as anesthetics; brief notes on their past uses are included. 3) Some seem to be worthy of investigation. Included also is a list drawn up from ethnobotanical sources of plants, used by native peoples to relieve pain which have not yet been studied. Though by no means complete, the list seems worth publishing. 4) There are, finally, plants which have no anesthetic action, but which are used in modern surgical procedures to alleviate pain—adjuncts in man's fight against pain.

Curare. Curare has no anesthetic action whatever, but it is used in surgical procedures designed to relieve pain and preserve life. The early accounts of curare arrow-poisons are extremely confused; we know now that the descriptions did not always refer to the same poison. In 1516, Peter Martyr Anghierus described "curare," and in 1595, Sir Walter Raleigh gave an early English account of "curare" in his "Discovery of the Large, Rich, and Beautiful Empire of Guiana."

Schomburgk published *On the Urari* in 1837, reporting his observations on the native method of preparing the poison. The Indians of British Guiana used more than half a dozen poisonous plants. Schomburgk judged the principal poison to be the bark of *Strychnos toxifera*. This contributed to the belief that "curare" was a strychnine-like convulsant poison. Much of the curare of South America—including that which has supplied therapeutically valuable agents—is made principally from various menispermaceous plants, especially of *Chondrodendron*, *Abuta* and several related genera.

The French physiologist, Claude Bernard, began his experiments with curare in 1884. Accurate physiological experiments, however, could not be carried out until the drug had been extracted and purified; the chemists Preyer (1865) and Boehm (1886–1897) are credited with these achievements. But years passed before modern medicine knew definitely the source of the drug and acquired adequate supplies of it.

In 1934, Richard Gill obtained the first good supply of curare of carefully determined botanical origin from Ecuador. Upon his return to this country in 1938, the potentialities of curare were brought to the attention of several physicians. Then, in 1935, Harold King showed that the activity of curare was due principally to the alkaloid l-tubocurarine. E. R. Squibb and Sons began marketing the chloride of the alkaloid under the trade name "Intocostrin" in 1939; it was this product which was first used by physicians in surgery.

Dr. H. Griffith at the Homeopathic Hospital of Montreal first administered Intocostrin to a patient under anesthesia in January, 1942. His success was reported in *Anesthesiology* of July, 1942. The use of curare derivatives as muscle relaxants in surgery subsequently gained wide acceptance. A host of commercial competitors of Intocostrin have been brought out, most of which vary only slightly from Intocostrin in their effect. Griffith, some nine years after his initial experiment, and after trying most of the commercial varieties of curare himself, wrote: "Personally, [I] am quite unable to decide whether any one is safer or better than several others." (35)

Curare derivatives characteristically block transmission of nervous impulses across the neuro-muscular junction to the muscles. Thus, muscle contraction is prevented. With curare relaxation, the surgeon can then give his full attention to operating.

Ololiuqui (*Rivea corymbosa*) is a large, twining, woody vine of the Convolvulaceae; a Morning Glory. Early accounts of the plant were written by the Spanish chroniclers of Mexico shortly after the Conquest. In 1590, Acosta first reported the anesthetic properties of ololiuqui seeds in his *Historia natural y moral de las Indias*. . . He wrote [fide Schultes (73)]:

> "They said they felt thereby a notable ease, which might be, for that the tobacco and ololiuqui have this property of themselves, to benumb the flesh, being applied in manner of an emplaste, which must be by a stronger reason, being mingled with poison, and for that it did appease and benumb the pains, they held it for an effect of health of a divine virtue."

The religious persecution of native cults by the Spaniards forced their rituals into hiding; since ololiuqui seeds were used in these rituals, the botanical identity of the

plant also was lost. Botanists, unable to point to narcotic principles in the family, were left to guesswork. Safford deduced that "ololiuqui" could not be a Convolvulaceae, for no member of this family was known to contain a principle acting on the central nervous system. He suggested that the early accounts described *Datura* flowers, and he noted that the narcosis described by the early writers resembled *Datura*-intoxication. Safford's reasonable deductions were wholly wrong. In 1938, Schultes found *Rivea corymbosa* in use as a narcotic in Oaxaca, Mexico, and advised investigation of the anciently reputed analgesic properties of the seeds (73):

> "The numerous statements to the effect that ololiuqui was used to benumb the flesh and to mitigate pain command attention, because of the fact that an analgesic alkaloid has been isolated from a related convolvulaceous plant—*Convolvulus pseudocantabricus*— . . . it seems very probable that the seeds were used by the Aztecs to kill pain and that further investigation of *Ricea corymbosa* may reveal that this plant . . . possesses analgesic constituents."

Further investigation was not forthcoming. In 1956 (74) and again in 1960, Schultes (75) recommended that investigation be begun. Osmond, a Canadian psychiatrist, had, by this time, reported the experimental effects of the seeds.

What was needed was chemical isolation of the active principle. Finally, in 1960, Hoffman and Tscherter (44) reported the isolation of three crystalline alkaloids of the ergot type from *Rivea corymbosa*: namely, ergine, isoergine, and chanoclavin. It is remarkable that a species in such an advanced family should have alkaloids found also in the fungi. These alkaloids, however, apparently lack analgesic properties. Was the early report inaccurate or is there still investigation to carry out?

The poison hemlock. The poison hemlock (*Conium maculatum*) has been used as a local anesthetic from classical times. It is now known that the fully grown, unripe fruits of the herb contain the toxic ingredients coniine, methylconiine, cicutoxin, conydrine, conic acid, oil of conium and paraconiine. In particular, the alkaloid coniine has been used as a medullary depressant. Apparently the ancients, aware of the poisonous action of coniine when taken internally, supposed that it would be efficacious if used externally as well. Using the poison hemlock as a local anesthetic may have gained them placebo-like relief from pain, but no other relief, since *Conium*-extract is absorbed apparently neither through broken nor unbroken skin. The poison hemlock is not an anesthetic agent; all reports to the contrary are unsound.

Aconite. Aconite is obtained from the tuberous roots of the perennial herb, the monkshood (*Aconitum Napellus*), native to the Alps, Pyrenees, and other mountainous regions of Europe and Asia. Of the 80-odd species of *Aconitum,* many are poisonous. The first mention of the use of aconite as an anesthetic in surgery is found in the early Chinese literature: Hoa-Tho combined aconite (species unknown), Daturas, and Hyoscyamus as an inhalation anesthetic. In ancient Greece, the herb had a reputation like that of the upas-tree (*Antiaris toxicaria*). It was not employed in medicine, however, until 1762, when Störck, a Viennese physician, introduced it into regular practice. The commercial supply of the drug comes chiefly from Europe, and in general, the drug was used more widely there than in the United States. The plant contains several alkaloids, the chief of which is aconitine. Aconitine is a poison when taken internally, a local anesthetic when used externally. But it paralyzes the senses of touch and temperature as well as those of pain, and care must be taken not to use the drug in the area of an open wound, lest the drug enter the circulatory system. These dangerous characteristics have led to its abandonment by medical practitioners. A survey of the current literature reveals no recent work on the drug; it has apparently lapsed into obscurity as newer, better drugs became available.

Gelsemium. Gelsemium is an ornamental evergreen vine, native to the woodlands and lowlands of the American South. The roots of the yellow jasmine or jessamine, as it is commonly known, yield the alkaloid gelsemidine which acts primarily as a stimulant, but, with increasing dosage, as a depressant. Gelsemidine's mode of action is apparently

unknown. Formerly, gelsemidine was used as a sedative and analgesic. It is currently employed in treating certain facial neuralgias.

Duboisia. *Duboisia myoporoides,* a large solanaceous shrub native to northern Australia, has long been used by natives as a masticatory and fumatory: its alkaloids first stimulate, then narcotize. Another species of *Duboisia, D. Hopwoodii,* or "pituri," was similarly used. An additional use was that of a fish poison. Investigation has shown that the active ingredients are hyoscyamine and scopolamine. This shrub is, at present, the chief commercial source of scopolamine.

List of additional plants. In surveying the literature, many plants, other than those discussed above, were noted as possessing pain-relieving properties. These plants are listed below, along with the bibliographical source, and, whenever possible, the purpose for which it was used and the part of the plant employed. Since this is merely a compilation of literature references, it should be taken as an entirely uncritical listing.

TABLE 1. LIST OF PLANTS POSSESSING PAIN-RELIEVING PROPERTIES

Plant	Part Used	To Relieve	Bibliographic Source
Achillea borealis	--------	pain of heat	79
Achillea lanulosa	leaves, root	toothache	83
Achras Zapota	gum	toothache	78
Actaea arguta	roots	rheumatism	20
Azfelia quanzensis	bark	toothache	32
Aloe vera	leaf pulp	headache	78
Aplopappus spinulosus	--------	toothache	89
Anacardium occidentalis	bark, leaves	toothache	21
Antennaria margaritaceum	flowers	--------	46
Anthemis Cotula	--------	--------	46
Arctium Lappa	--------	--------	46
Argemone mexicana	juice	skin pain	33
Aristolochia mexicana	--------	rheumatism	27
Aristolochia serpentaria	--------	--------	46
Artemisia discolor	--------	--------	76
Asclepias syriaca	--------	--------	46
Bixa Orellana	leaves	headache	78
Calophyllum inophyllum	gum	----	22
Castalia odorata	--------	--------	46
Catalpa bignonioides	pods	--------	46
Celtis occidentalis	bark	--------	46
Chlophophora tinctoria	sap	toothache	78
Cicuta maculata	--------	--------	46
Clematis lingusticifolia	--------	--------	89
Corylus americana	nut-oil	toothache	46
Cryptantha Jamesii	--------	earache	89
Cynoglossum officinale	--------	raspy cough	16
Datura innoxia	--------	--------	22
Derris elliptica	whole plant	itches	66
Ervatamia divaricata	root	--------	22
Erythrina suberosa	leaves	toothache	22
Eucalyptus tereticornis	--------	--------	66
Euphorbia gorgonis	latex	toothache	59
Euphorbia hirsuta	--------	--------	46
Faurea speciosa	leaves	earache	32
Ferula Narthex	gum	--------	22
Gazania pinnata	root	toothache	59
Gnaphalium polycephalum	--------	--------	46
Hamamelis virginiana	--------	--------	40
Heckaria umbellata	--------	headache	77
Helenium Hoopesii	root	rheumatism	20
Humulus Lupulus	--------	--------	46
Indigofera tinctoria	leaves	stings	22

TABLE 1.—Continued

Jasminum Sambac	roots	--------	66
Krugiodendron ferreum	bark	toothache	78
Lactuca canadensis	leaves	--------	46
Lactuca elongata	leaves	--------	46
Lycopodium clavatum	--------	headache	76
Malvastrum coccineum	--------	pain of heat	79
Melaleuca leucodendron	--------	general aches	66
Mentha arvensis	--------	headache	66
Mentha piperita	--------	--------	46
Noringa oleifera	--------	--------	22
Ocimum sanctum	roots, leaves	stings, earache	22
Oroxylon indicum	root bark	--------	22
Papaver dubium	--------	--------	46
Peganum Harmala	seed	--------	22
Pimpinella Anisum	seed	rheumatism	20
Plantago cordata	leaves	--------	46
Plumbago capensis	root	headache	59
Psoralea pentaphylla	--------	labor pains	27
Randia dumetorum	bark	rheumatism	22
Sanicula canadensis	root	--------	46
Sanicula marilandica	root	--------	16
Sanseviera thyrsiflora	leaf	toothache, earache	59
Sarracenia variolaris	--------	--------	46
Scopola carniolica	--------	--------	64
Scopola japonica	rhizomes	--------	17
Scrophularia nodosa	--------	--------	16
Semecarpus Anacardium	--------	--------	22
Senecio Balsamitae	--------	--------	46
Solanum carolinense	fruit	--------	46
Solanum Dulcamara	--------	--------	46
Solanum nigrum	berries, leaves	--------	22
Solanum pseudocapsicum	--------	--------	46
Solanum virginianum	leaves	--------	46
Solanum xanthocarpum	leaves	--------	22
Spirostachys africanus	bark	headache	59
Thuja plicata	leaves	general pain	76
Tragia species	--------	surgical pain	26
Ulmus pubescens	--------	--------	40
Urera caracasana	leaves	headache	78
Valeriana pauciflora	root	--------	46
Verbascum blattaria	flowers	--------	46
Verbascum thapsus	root, leaves	earache	46
Verbena ambrosiaefolia	--------	general aches	20
Xanthoxylum fraxineum	--------	toothache	40
Xysmalobium undulatum	root	headache	59
Zea Mays	stigmas	--------	46

Conclusion

The history of the pain-relieving drugs has been an enigma in one respect at least: why, if pain-relieving drugs were so nearly within reach, did it take Man so many centuries to realize their potentialities? Several hypotheses have been put forward. One asserts that doctors were unwilling to experiment, fearing they might inadvertently cause death and thus break the Hippocratic oath. The social scientists sometimes lean to the belief that, because pain provides an opportunity to show fortitude, the demand for pain-relievers may not have been nearly so great as we are now led to assume it to have been. "Union Rules" also come in for their share of "guilt." In medieval times, the physicians' guilds strictly prohibited surgeons from giving internal medicines, for surgeons were considered mere unlettered craftsmen. Thus, they could do little about relieving pain, even if they were inclined to try. Finally, religious-superstitious beliefs can be held

partly responsible. Pain and death were held by many cultures to be inflicted by God on a wicked people, and any attempt to avoid them could be considered opposition to Divine Will.

The future will certainly see no decrease in the demand for pain-relieving drugs. If the present state of affairs can be taken as an indication, the decline in importance of botanical analgesics and anesthetics should continue. Nature has fortuitously provided Man with certain pain-relieving drugs; Man improves on his legacy. With advanced chemical techniques, pharmacologists and chemists are now able to prepare an infinite variety of compounds, delicately balancing their toxic against their therapeutic properties. Man's rational planning has in the end yielded better anodynes than Nature's random gifts. Nature has provided the starting point for chemical research, and Man has learned to attempt variations on Nature's themes. We might well expect Man to continue making superior analgesics and anesthetics—and Nature to go right on providing starting points for his research.

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The Botanical Aspects of Ancient Egyptian Embalming and Burial[1]

The ancient Egyptian art of embalming, a highly developed process, involved many plants and plant products. Thirty-one genera of plants have been mentioned by various writers in the operations of embalming, cosmetic application, wrapping and coffin construction. The materials employed and methods of use have interested scholars of all periods. Herodotus gave the earliest account of the various aspects of embalming.

BILL B. BAUMANN[2]

Introduction

The purpose of this paper is to emphasize the dominant role played by plant products in the preparation for burial of mummies and to include the name of any plant thought to have been employed in that capacity. Part I establishes the species of plants used in the preparation of the dead for burial. Part II considers some of the historical, commercial and botanical aspects of these plants as they applied to the ancient Egyptians.

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PART I.

Embalming

Predynastic. The origin of Egyptian embalming dates back about 5200 years to the first dynasty.[1] Before the first dynasty, it had been the custom to bury the dead in a pre-natal position in a shallow, sandy grave after evisceration and wrapping with matting, linen or skins. The warmth and dryness of the Egyptian climate seemed adequate to desiccate the body quickly and thus maintain it, in some cases, in a fair state of preservation. The body may have been dried in the sun or with the heat of a fire, however (7).

Classical. The most ancient (and quite accurate) account of the processes of mummification is to be found in the writings of Herodotus (20). Herodotus describes in some detail three cost-categories of embalming. He tells of drawing "out the brain through the nostrils" with a "crooked iron," after which the skull is rinsed with "drugs." Next the body is eviscerated through an incision in the flank and the cavity cleansed with "palm wine" and an "infusion of pounded aromatics." "After this they will fill the body with bruised myrrh, with cassia and every sort of spicery except frankincense, and sew up the opening." This was followed, according to Herodotus, by 70 days of soaking the body in a natrum[2] solution. It was then washed, wrapped in "cloth" and "smeared over with gum." In a less expensive preparation, "oil from the cedar tree" was injected into the bowel, the passage stopped and the body placed in natrum for the prescribed time. The pas-

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[1]Prepared for the course in economic botany, Harvard University, under the direction of Dr. Albert F. Hill.

[2]Present address: Washington Univ. Sch. of Medicine, St. Louis 10, Mo.

[1]See the appendix for a chronology.

[2]Natrum (or natron) is a naturally occurring mixture of sodium salts and may be obtained in a crude, solid form in several areas in Egypt, among them the Wadi-el-Natrun about 50 miles NW of Cairo.

sage was then unstopped and "such is its power (the cedar oil) that it brings with it the whole stomach and intestines in a liquid state." In the cheapest preparation, the intestines were merely cleared out with a "purge."

Diodorus Siculus (13) also discusses embalming. He mentions that the body is treated with "cedar oil and certain other preparations, and then the body is treated with myrrh, cinnamon and such spices . . . that will preserve it and give it a fragrant odor." Diodorus states that such care is taken that even the hairs of the eyelids and eyebrows remain intact after embalming.

Although the accounts given by Herodotus and Diodorus are largely accurate, there are, apparently, some errors. One of these in Herodotus is in the period (70 days) he says was required for embalming. Probably the actual embalming took only 30 days (as reported by Diodorus); the additional 40 days constituted the remainder of the mourning period.

After the viscera were removed through an incision in the flank, they were carefully embalmed with various substances. Natrum was employed as a desiccant. Coarse sawdust of "aromatic woods," (52) and sandalwood (supposedly) were sprinkled on, or stuffed into, them. It is unlikely that sandalwood was used, however, since Egypt established trade with India, the source of sandalwood, only in about the third century B.C.—long after the art of embalming had waned. The viscera were next moulded and wrapped in separate linen packets and placed in one of several places: between the legs, (50) in four canopic jars placed in the tomb, or in the thoracic and/or abdominal cavities. Budge (7) and others believe that the viscera were commonly stuffed with bitumen,[1] but the point is made by Mendelsohn (34) that the black material found in and on mummies is in all likelihood aged resin and gum-resin. Wood pitch may have been used on some occasions.

The brain was customarily removed—via a hole chipped in the ethmoid bone—through the nostrils. The skull was then rinsed with some substance, supposedly a product of cedar or juniper trees, about which there is great discussion. Lucas (29) feels that the "cedar oil" of Herodotus and Diodorus and the "cedrium" mentioned by Pliny as having been used in Egyptian embalming are actually concoctions of turpentine, pyroligneous acid and wood tar. According to the Rhind Papyri, after the skull was cleansed. . . . "Anubis as embalmer filled thy skull with resin, corn of the Gods . . . cedar oil, mild ox fat, cinnamon oil and myrrh is to all thy members."

The exact identities of "corn of the Gods" and "ox fat" are obscure. As for cinnamon, it is extremely doubtful that it could have been employed in embalming before 300 B.C. (see Part II). There is abundant evidence that resins and resin-soaked linen rags were used to stuff the cranial cavity (perhaps, also, bitumen and/or wood pitch in some cases).

Other refinements included: packing the empty orbits with linen balls or onions painted to resemble eyeballs; stuffing resin-soaked linen under the skin and subsequent moulding of the physical features (54); stuffing the ears with resin plugs (51) or onions (52).

Until recently, it was universally believed that, immediately following evisceration, the body was soaked in a natrum *solution*. But Lucas (29) argues against

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[1]Bitumen is a black asphaltous material probably obtained near the Asphaltites Lake (near the Dead Sea) in Palestine. The word mummy itself is derived from the Arabic "mumia" which was given to the pitch-like bitumen (or, at least, what was thought to be bitumen) from Egyptian mummy remains. "Mummy" (that is, the "bitumen" from mummies) was, until three or four centuries ago, a standard medication for bruises and wounds.

the use of a solution and contends that natrum was used in a dry state exclusively as a desiccating agent. "The phraseology of Herodotus, Diodorus, Athenaeus and other writers makes it perfectly clear that the ancient Egyptian process of embalming the human body was analogous to that of preserving fish . . ." and in ". . . Ancient Egypt fish were preserved by drying with, or without, the use of salt" (29).

After desiccation, the body was treated with myrrh, cassia, "every sort of spicery except frankincense" (according to Herodotus); myrrh and cinnamon (according to Diodorus). Thomas Greenhill (17) claims that the cavities of the body were ". . . repleted with a composition of myrrh, aloes, cinnamon, opobalsamum (myrrh), saffron and the like." Gannel (15) mentions myrrh, aloe resin, canella (impossible: see Part II) and cassia lignea. Pettigrew (41) mentions colocynth as a component of one of the mysterious anointing balsams and Dr. J. C. Warren (62) states that a mummy he examined contained friable resins with no particular odor. The balsam, storax, was identified by Reuttner (29) in undated mummy material and Tschirch and Stock (60) mention gum mastic as one of the ingredients of mummy remains. According to the Boulaq Papyrus, the head was anointed with frankincense—as opposed to the statement by Herodotus.

The sources of the resins used are in question. Lucas (29) suggests the Cilician fir (source of Egyptian "ach wood"), the Aleppo pine, stone pine and oriental spruce. It is unlikely that oriental spruce was employed, however. Its area of distribution (North Asia Minor, Armenia, Caucasus) was much further from Egypt than other good sources of resin and was beyond the normal trade area of the Egyptians. Another likely source of resin was the Cedar of Lebanon (64).

The body cavity sometimes contained onions (one or two) (52), lichens and sawdust (sometimes cedar) (64). As the embalming art began to fail in later dynasties (circa XXI), sand, mud and linen rags were commonly employed as cavity packing and, at its lowest point, the body appears to have been merely soaked in wood pitch, bitumen or resin.

Before wrapping the body, various materials were sometimes stuffed into the limbs, neck, back, etc., in order to restore natural contours (52). The body was customarily painted over with resin before wrapping and occasionally sprinkled with "aromatic wood chips." (Pettigrew (41) says one mummy smelled of cassia and cinnamon).

Little need be said about the lower priced preparations mentioned by Herodotus and Diodorus except to say that in the lowest priced one the abdomen was rinsed out with "smyrea," a liquid which, according to Pettigrew (41), was a mixture of senna and cassia (impossible: see Part II).

Cosmetics

Although cosmetic fidelity was not of prime importance, there are many cases in which the soles of the feet, hands or the nails have been stained red. Henna was probably the commonest source of this red dye, but madder and kermes[1] may also have been employed (29). *Carthamus tinctoria is* another possibility.

During the 21st dynasty, it became customary to color the body, or shroud, of the mummy red if it were a male and yellow if it were a female. In addition to the above dyes, which were probably also used in this capacity, inorganic paints with a gum base (probably gum Arabic) were used. Dyeing is an ancient art in Egypt. Reisner (48) describes a pre-dynastic

[1]Kermes is a dye prepared from the bodies of female insects of a variety allied to the cochineal insect. These are found on several species of oak in the Mediterranean region; most commonly on *Quercus coccifera.*

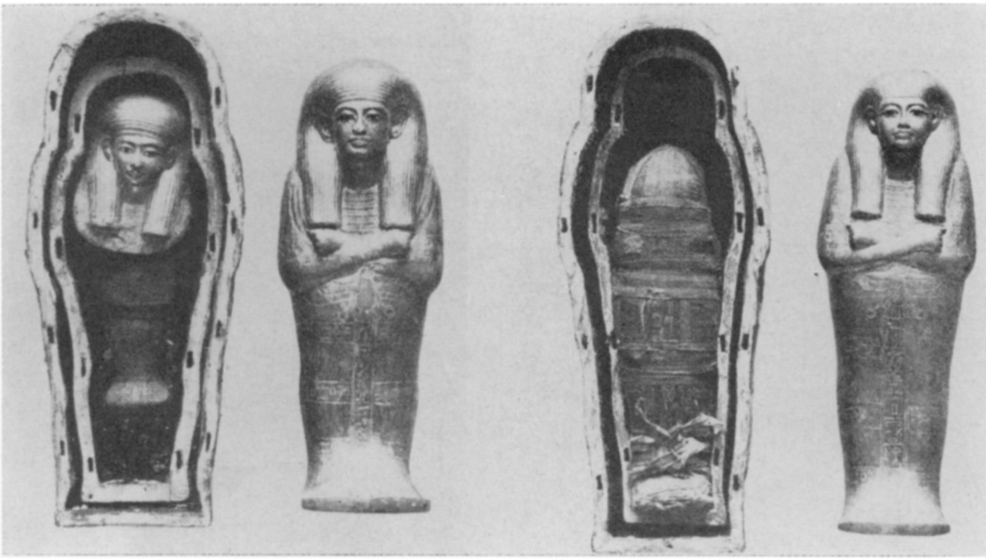

Fig. 1. Two coffins and mummies of still-born children. (After Carter).

grave in which the edges of a "shroud" mat found there had been dyed red.

Wrappings

Mummy wrappings were, almost without exception, made of linen. The wrappings, sometimes sheets but usually bandages, were approximately 3½ inches wide and 3-13 feet long and varied in texture from that of the "finest cambric" (10) to the very coarse. Two notable exceptions exist, however. In these cases the wrappings consisted of woven aloe fibers (Rameses II) and papyrus sheets (Lady Hentmehit).

The bandages were wrapped around the body in a many as 25 (62) or more layers, gum Arabic being employed frequently as an adhesive. They were sometimes soaked in resin. This permitted sculpturing of the features so as to resemble the living state (51, 54).

Coffins

Coffin construction probably began in Dynasty III. A six-ply coffin from that period was constructed from cypress, juniper, pine and sidder. A fifth dynasty tomb inscription states that ". . . His majesty commanded that there be made for him a coffin of ebony wood," but no ebony coffin has yet been discovered. During the sixth to twelfth dynasties, yew and acacia were often used. During the tenth dynasty, cedar became popular. Other woods employed were sycamore, fig and oak (oak in the shrines surrounding the coffins of Tut-ankh-amen).

The joints of coffins were fastened with wooden pegs or linen bandages and the spaces between the planks were filled with earth and gum (probably gum Arabic) (50).

Between the twelfth and eighteenth dynasties occurred two important developments in the use and construction of coffins: the series of nested coffins (Fig. 1) and the anthropoid coffin (Fig. 2). Although it was often carved from wood, the anthropoid coffin was also commonly moulded from a material like papier-maché consisting of plaster and layers of linen or papyrus. Coffins in later dynasties were varnished with a resin, the identity of which is unknown.

When the wrapped mummy was laid in the coffin, it was often "anointed" with a

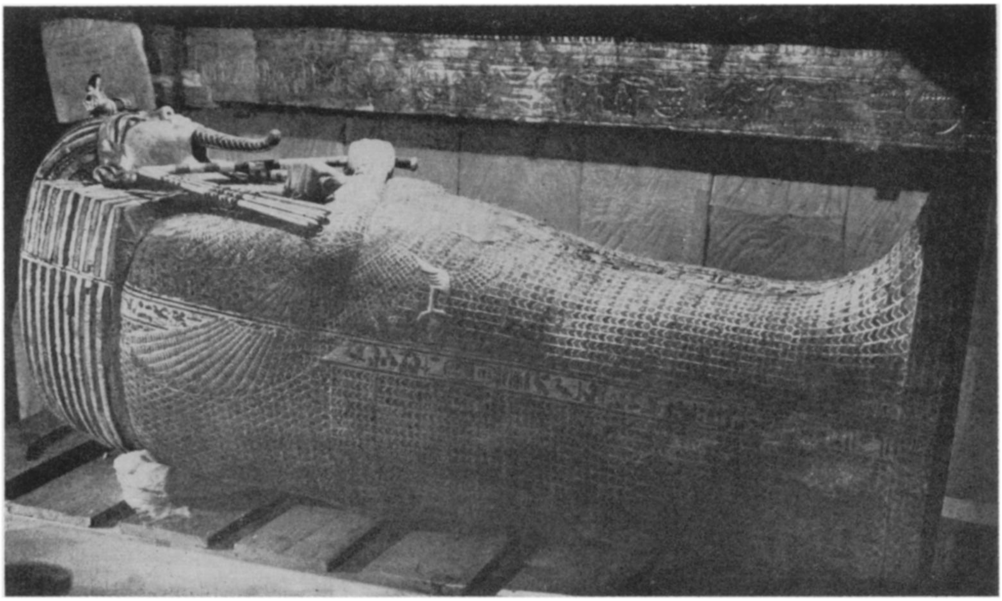

Fig. 2. Second coffin of Tut-ankh-amen. It is 6′ 8″ long; of carved heavy wood (oak?); overlaid with sheet gold on gesso; inlaid with opaque polychrome glass simulating red jasper, lapis lazuli, and turquoise. (After Carter).

viscous material which, in some cases, appears to have been wood pitch (probably from *Juniper* spp.) and, in others, a mixture of about 10% fatty material and 90% resin (29). This black resinous material was frequently the well-known "kyphi," an ointment of which Plutarch (in Isis and Osiris) states there are sixteen ingredients and Dioscorides ten. Some of these components are known with certainty. One is gum mastic (60, 64). Another, according to the Ebers Papyrus, is some product from "cyprus" (probably *C. papyrus*) (64). Others are frankincense, myrrh, juniper berries, "nebk" (*Zizyphus spina-christi*) and raisins. The "anointment" was sometimes so thorough as to "glue" the mummy firmly in its coffin.

PART II[1]

THALLOPHYTA

Lichens

Parmeliaceae

Evernia furfuracea (*Parmelia furfuracea*). The "sprout lichen" commonly grows on dead wood and tree bark, occasionally on certain species of *Pinus*. This genus, sometimes called "oak mosses," yields an extract known as "Mousse de Chene" (or oak moss resin), which is an important base in modern perfume manufacture. The essence of this extract is a phenol, lichenol.

It is not known whether the Egyptians used this lichen to pack the body cavity because of supposed preservative properties — the characteristic musk-lavender odor is not pronounced before extraction —or whether it was purely an accident that this potentially aromatic material was employed. It is known, however, that this lichen was an ingredient used in breadmaking.

E. furfuracea does not grow today in Egypt, but must be imported from the more moist Islands of the Archipelago. It is likely that the ancient Egyptians, too, imported this material (37, 39, 46, 64).

[1]A table following this part gives a summary of names and uses of plants discussed.

SPERMATOPHYTA
Gymnospermae
Cupressaceae

Cupressus sempervirens. "Gopher wood," or "cypress," of antiquity, is fabled for its durability and has been a favorite for coffin construction since the Egyptians introduced it nearly five thousand years ago. It is a tall tree, normally 80-90 feet, and its wood produces a pleasant, insect-repelling odor.

It is not native to Egypt and what few specimens grow there today are cultigens. Rather, it is indigenous to Iran and the Levant and probably reached Egypt through Palestine, Lebanon or Latakia.

Its remarkable lasting properties and durability were spoken of by Pliny (43) ("Pine and cypress are the strongest to resist rot and wood-worms") and it is reputed to be one of the four woods used in the construction of the cross upon which Christ was crucified (8, 11, 21, 27, 29, 35, 45).

Juniperus spp. Since most ancient times, junipers have been confused with (and referred to as) cedars. This complicates efforts to learn the real identity and use of both *Cedrus* and *Juniperus* from ancient records. There is at least one instance in which the Egyptians were apparently aware of some difference between the two genera, however. On one of the Karnak obelisks (Dynasty XVIII) it is written: "They have brought me the choicest products of . . ? . . consisting of cedar, of juniper, and of meru wood." There is tangible proof, however, that the Egyptians used juniper in coffin construction (earliest: Dynasty III)—probably *J. phoenicea* L. Twigs of *J. phoenicea* have been found in the Graeco-Roman cemetery at Harawa (29). Berries of *J. phoenicea* and *J. drupacea* Labill. have been found in many burials, the oldest being pre-dynastic. They were supposedly an ingredient of kyphi ointment.

Egypt has no native junipers. *J. phoenicea* is native to Phoenicia (a narrow strip of land between Lebanon and the Mediterranean) and probably reached Egypt through Byblos. *J. drupacea* is native to Syria and was, likewise, probably obtained at Byblos by the Egyptians. Post (45) also lists *J. oxycedrus* L. and *J. macrocarpa* Sibth. & Sm. as indigenous to the Lebanon-Palestine region.

The juniper is venerated by Christians as the tree that hid the infant Jesus when He and Mary were overtaken by Herod's assassins, on the way to Egypt (11, 14, 29, 45, 64).

Pinaceae

Abies cilicia. The Cilician fir is native to Asia Minor and North Syria where it occurs in extensive forests on Mount Lebanon and the Antitaurus in association with the Cedar of Lebanon. According to Lucas (29) the Zenon Papyri (dated 256 B.C.) refers to the planting of 300 fir trees in Egypt.

Abies cilicia is a large tree, up to one hundred feet tall and seven feet in girth. Loret and Jacquemin (in Lucas, 29) believe that it was the source of the famous "ach resin" and "ach wood." Apparently fir was not much used in coffin-making as only one example is known and that well into the twenty-fifth dynasty (11, 29, 45).

Cedrus libani. The famous Cedar of Lebanon is a true cedar. For thousands of years its 70-100 foot height and 16-25 foot girth have inspired men with thoughts of strength and solidarity and the trees have always been regarded with what Franklin Lamb (24) calls "sacred awe." The Cedar of Lebanon usually grows in association with pines and firs. The forests were extensive in Biblical times, but only five small groves exist today—about 6000 feet up Mount Lebanon. These are under the care of a Christian sect called the Maronites.

The wood is fragrant, insect-repellent, quite durable and rot-resistant. It was

highly esteemed by the Egyptians for packing the body cavities of mummies, for many kinds of wood-work and very much so for coffin-making. It was first used in coffins sometime around the tenth dynasty and persisted well into the Ptolemaic period.

According to tradition, *Cedrus libani* was another of the four species of trees from which Christ's cross was made (11, 14, 21, 24, 45).

Pinus halepensis. The Aleppo pine is native to Palestine, Lebanon and Asia Minor. It almost never exceeds 50-60 feet in height and 12-15 feet in girth. It was rarely used in coffin construction since pine is not rot-resistant. The earliest evidence of its use in that capacity is the third dynasty plywood coffin from Saqqara. It is likely, however, that it was extensively employed as a source of resin and pitch. It is widely cultivated in the Mediterranean area today as a source of naval stores (11, 18, 29, 45).

Pinus pinea. The stone, or umbrella, pine frequently grows to a height of 80 feet and a girth of up to 20 feet and is highly valued not only by the naval stores industry, but also as an ornamental because of its picturesque umbrella-shaped crown. *P. pinea* has been widely cultivated for centuries and grows today throughout the Mediterranean area, Southern Europe and even in the British Isles. This confuses attempts to locate its origin but Post (45) feels that it is native to Asia Minor and Dallimore and Jackson (11) extend its original home from Asia Minor to Portugal.

There is no proof that this species of pine was ever used in coffin-making. It seems unlikely that it was a source of resin until the beginning of the Middle Kingdom when trade began to connect with parts of Asia Minor (11, 45).

Taxaceae

Taxus baccata. The common yew, or ground hemlock, is noted for its short, thick trunk (total height about 30-60 feet; girth, 20 feet; branches very near the ground) and the great strength, durability and elasticity of its wood. These last characteristics are responsible for its having long been used in bows.

It now occurs in many places around the world. In the Lebanon-Palestine area, undoubtedly the source of yew for the Egyptians, it is found in the hills and mountains.

Yew was first used in coffins at about the time of the sixth dynasty. It could not have been used as a source of resin since the tree is one conifer which yields no resin (11, 21, 29, 45).

ANGIOSPERMAE

Monocotyledonae

Cyperaceae

Cyperus Papyrus. The bulrush is a tall (8-16 feet) sedge once extensively cultivated along the shores of the Nile. The stem is triangular, smooth and composed of pith encircled by a tough rind. The plant grows today over a wide area bounded roughly by the 38th and 26th parallels on the north and south and by the 65th and 32nd on the east and west, but is virtually absent in the lower Nile marshes where it flourished in ancient times.

The origin of *C. Papyrus* is not generally agreed upon but Woenig (64) feels that it may have originated in Nubia and then spread down the Nile to lower Egypt. At any rate, this plant grew and was cultivated in Egypt and it was not imported.

C. Papyrus was used early in many capacities. One of the first evidences was a "reed" mat under the skeleton of a predynastic burial found by Petrie (40) at Naqara. The earliest evidence of its use as the famous papyrus "paper" dates back to the first dynasty about 5200 years ago. This was an unused roll, as mentioned by Emery in The Tomb of Hemaka, according to Lucas (29).

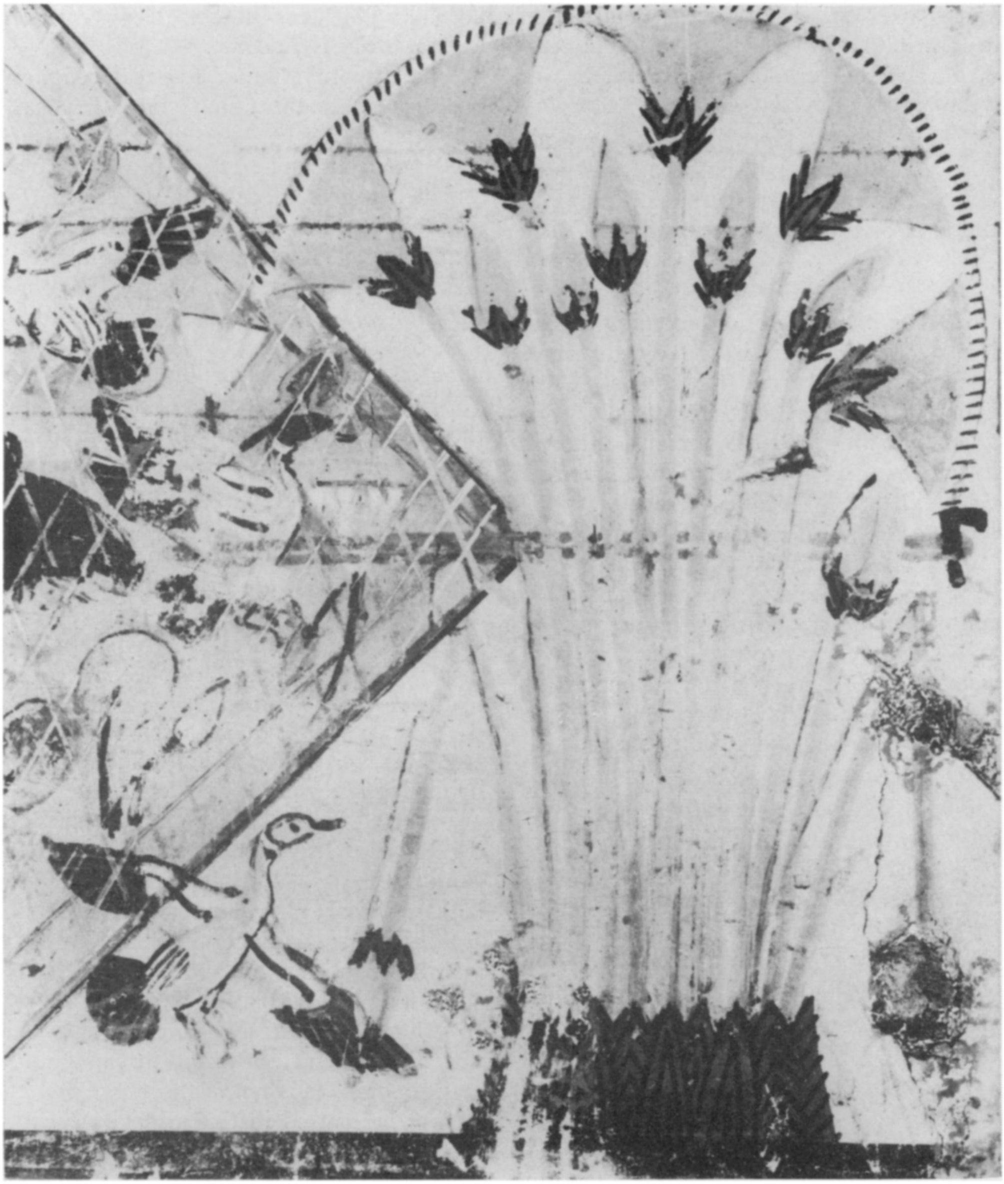

Fig. 3. Papyrus plants growing along a river bank as represented in a wall painting in the Deir-el-Bahari Temple at Thebes (circa 1400 B.C.). (Courtesy of Boston Museum of Fine Arts.)

Papyrus "paper," the commonest use to which *C. Papyrus* was put, was prepared by slicing the pith of the stem into long strips, applying some adhesive (about which there is great discussion and no conclusion) and pressing. It was then dried and impregnated with worm-repellent juices. Although papyrus was commonly employed as a writing surface for manuscripts, we have seen that it was also used for making cartonnage mummy cases, as a background for portraits to be

placed over the face of the mummy, that it contributed in some way to kyphi ointment, and that in one case a mummy was wrapped in papyrus sheets.

Pliny (43), Herodotus (20), and Theophrastus (58) discuss papyrus quite extensively and have mentioned many of the uses of the plant (8, 29, 35, 40, 64).

Iridaceae

Crocus sativus. This fall-blooming species is noted primarily for the dye, saffron, which is derived from its stigmas. There is no evidence that this dye was ever used as such by the ancient Egyptians, although it was used by the Greeks and Romans. Greenhill (17) claims, however, that saffron was used in embalming (it contains an aromatic oil which breaks down to yield a terpene and crocose), and if we can believe his account (I find no one else who mentions saffron as being used in embalming), it is then not inconceivable that saffron may have been used, at least occasionally, in dyeing the shrouds or bandages of mummies.

The likelihood that saffron was used in embalming and/or dyeing would seem to be improved by the reference to saffron in the Ebers Papyrus where (according to Woenig (64)) it is mentioned as an ingredient in a cure for "kidney trouble."

The solution to this problem is little aided by a consideration of the origin of the plant, for there is no real certainty as to the place or places in which it first developed. Most authorities suggest Greece, Italy, Asia Minor and/or Persia (12, 16, 17, 35, 45, 61, 64).

Liliaceae

Allium Cepa. The common garden onion is one of the oldest of cultivated plants. It is known today only in the cultivated state and is grown around the world. The origin of *A. Cepa* is not certain although Vavilov (61) states that its primary center was probably in Central Asia with secondary centers in the Mediterranean area and the Near East.

The Egyptians attached great religious significance to the onion since they saw reflected in it their own cosmology with the concentric spheres of heaven, earth and hell represented in the layers of the bulb. Thus, it is probable that the onions found in the body cavities of mummies were present for religious purposes rather than for any fancied preservative function (35, 61).

Aloe succotrina. According to Moldenke (35), this was the species of aloe used by the Egyptians in embalming although there are 170 species native to eastern and southern Africa and the Mediterranean basin and it would appear that there could be no great certainty as to the species employed. *A. succotrina* originated on the Island of Socotra just off the east coast of Africa at the mouth of the Red Sea. The inspissated juice has long been used in medicine as an emmenagogue and purgative.

"Aloes," a resinous material, is obtained by drying the juice of the plant. The juice is collected in animal skins after cutting off a leaf or leaves. It varies from dark, ruby-red to a yellowish or reddish brown, has a peculiar, almost fragrant odor, disagreeable taste and is easily confused with myrrh. The odor of "aloes" is due to a small amount of volatile oil.

"Aloes" contains a resinous component which would make it useful in embalming and although it is not often mentioned as having been used in that capacity by the Egyptians (Gannel (15) and Greenhill (17) mention it). Reuttner (according to Lucas, 29) detected "aloes" in some undated mummy material. There is certainty that "aloes" was used in embalming near the end of the pre-Christian period. Nicodemus brought "aloes" [from *A. succotrina*, according to Moldenke, (35)] for embalming the body of Christ.

Although Mendelsohn (34) mentions that the mummy of Rameses II was

wrapped in bandages of aloe fiber "finer than India muslin," is is doubtful that the material was actually aloe and/or that it was "fine." Aloe fiber is occasionally used in cordage and coarse textiles, but it is difficult to imagine an aloe textile "finer than India muslin." Perhaps, though, he is only mistaken about the texture of the cloth and not the fact of its use (3, 8, 29, 34, 35, 38, 55, 60).

Palmae

Phoenix dactylifera. The date palm is the primary source of food, shelter and oil for innumerable inhabitants of desert regions. It grows from the Canaries to the Sahara and Arabian deserts to Southwest Asia and since it has been cultivated throughout northern subtropical Africa since remote times, its place of origin has never been satisfactorily determined. It is known to have grown abundantly in the region between the Euphrates and the Nile during pre-Christian times; the history of the genus extends well back into the Neolithic, possibly originating near the Indus.

Although the Egyptians used the tree for cordage, brushes, roofing, food and for many other purposes, emphasis is to be placed on its use as "palm wine" which, according to Herodotus and Diodorus was used for rinsing the body cavities and viscera in embalming. It is manifestly impossible to demonstrate "palm wine" in mummy remains due to its high volatility, but the ancients are known to have prepared intoxicating beverages from both the sap and the fruit of *P. dactylifera* and there is no reason to doubt the statements of our ancient historians that these wines were employed in embalming.

To make palm wine today, a deep incision is made in the trunk just below the leaves, the sap collected and allowed to ferment. Some say it has the taste of a very light, new, grape wine. "Date wine" is prepared by fermentation of macerated dates. This process is described by Pliny (43).

Pettigrew (41) thought that the function of palm wine in embalming was that of a tannin on the skin. This is unlikely, however (8, 12, 29, 35, 36).

Dicotyledonae
Anacardiaceae

Pistacia lentiscus. The source of "gum-mastic" is a native of the Mediterranean region and may be found today in Lebanon and Palestine although there is no more reason to believe that it originated there than anywhere else in the Mediterranean area. Today the main source of mastic—described as a true resin by some and as an oleo-resin by others—is the Island of Chios off the west coast of Turkey. "Chios mastic" is conceded to be the finest variety of the very expensive mastics.

The tree is a shrubby evergreen, seldom more than twelve feet in height and much branched toward the top. Mastic is the dried resinous exudation occurring naturally or obtained through a small incision in the trunk. The thick exudation either hardens in tears on the bark or falls to the ground and is picked up. The tears are the most highly esteemed form; they come in various sizes and shapes. Mastic is transparent, ranges in color from light yellow to greenish yellow and has a slightly balsamic odor due to pinene. It is widely used today as a masticatory, perfume, flavoring, medicine and varnish in microscopy.

The Egyptians used mastic in embalming, in the preparation of kyphi ointment, which was used in embalming as well as in religious capacities (it probably had religious significance even when used for embalming), and in perfumes. Theophrastus (58) and Pliny (43) describe *P. lentiscus* in such a manner that there can be no doubt of its identity in their works (16, 18, 35, 36, 38, 45. 60).

Burseraceae

Boswellia Carteri Birdw. This shrubby, thorny bush seldom attains a height of

Fig. 4. Egyptians importing live myrrh trees from Punt as seen in the wall reliefs of the Deir-el-Bahari Temple at Thebes (circa 1400). (Courtesy of the Boston Museum of Fine Arts.)

more than four to five meters and is sparsely branched. It is native to Somaliland, Abyssinia and South Arabia. *B. Carteri* is the chief source of frankincense (olibanum), an oleo-gum-resin which is the most important incense material in the world. Frankincense may also be obtained from other species of *Boswellia,* notably *B. papyrifera* Hochst. *B. thurifera* Roxb. ex Flem. (*B. serrata* Roxb.), all of which grow in and are native to Somaliland, Abyssinia and South Arabia. The "Incense from Punt (roughly: Somaliland at the Bab-el-Madab Straits)" and "white incense" of Egyptian records are probably frankincense.

Frankincense is gathered almost exclusively by Somali Indians who even cross the Gulf of Aden to obtain it in Arabia. During the hot season they make a deep incision in the trunk and peel off a narrow strip of bark about five inches below the incision. The sap exudes, dries and forms tears on the bark which are then picked by hand. These tears are usually less than one half inch in diameter, of

irregular shape and varying in color from nearly white to yellowish to reddish-brown. The taste is aromatic and somewhat bitter. Frankincense is composed of 60–70% resin, 30–35% gum and 3–8% oil of olibanum.

The Egyptians used frankincense not only as an incense, but also in perfumes, ointments and unguents (esp. kyphi) and in embalming. It was one of the gifts brought by the wise men to the infant Jesus (16, 19, 27, 30, 35, 60, 64).

Commiphora spp. Species of the genus *Commiphora* are the source of the Balm (or Balsam) of Gilead, also called Mecca Balsam or Myrrh of Gilead, and of myrrh. They occur in the same geographical area (Somaliland, Abyssinia, South Africa) as *Boswellia* spp. and their oleo-gum-resins are produced and harvested in a manner identical with frankincense. The trees are low and shrubby, seldom more than ten or twelve feet high, with thorny branches.

It is generally agreed that *Commiphora* (*Balsamodendron*) *opobalsamum* (L.) Engl. is the source of the Balms, Balsams and Myrrhs of Gilead and Mecca. The many references in ancient writings (including Egyptian) to balms and balsams probably refer most often to the gum-resin of *C. opobalsamum,* although it is apparent that the terms were used indiscriminately for many kinds of resins, gum-resins, gums, ointments, unguents, etc.

There is much more difficulty in determining the ancient source or sources of myrrh. There are 160 species of *Commiphora* and, of these, there are two in Arabia, one on the Island of Socotra, and forty-one in northeast Africa. The species which appear to be the main supplies of myrrh are: *C. myrrha* (Nees) Engl. var. *Molmol, C. Schimperi* (Berg) Engl., *C. erythraea* (Ehrenb.) Engl. and *C. abyssinica* (Berg) Engl. According to most authorities, *C. Myrrha* var. *Molmol* is the principal source of myrrh today, but Engler says *C. Myrrha* gives no resin at all. This disagreement arises because Engler recognizes *Molmol* as a species rather than a variety of *C. Myrrha*—in opposition to most writers.

Perhaps much of the confusion may be attributed to the fact that there are two types of myrrh: herabol and bisabol. Herabol (sometimes called "true myrrh") commonly occurs in rough, eroded tears, from 2.5 to 10 cm. in diameter. It is a dull red-brown and covered with powder; it tastes bitter although its odor is agreeably aromatic. Bisabol is much like herabol in color although it is more yellowish and less dusty. It is characteristically soft and gummy. Myrrh ordinarily contains 2-5% volatile oil (bisabol goes up to 8%), 25-50% resin and the remainder gum.

The Egyptians prized myrrh very highly for use in embalming, perfumes, ointments, (esp. kyphi) and unguents. There are many references to it in Egyptian records. In the Punt reliefs may be found the description of an eighteenth dynasty expedition where ". . . the loading of the ships very heavily with marvels of the country of Punt; all goodly fragrant woods of God's-land, heaps of myrrh resin, with fresh myrrh trees . . ." is described (see Fig. 4). The Egyptians often attempted the introduction of desirable plants not native to Egypt; Tschirch and Stock (60) state that myrrh trees *were* cultivated in Egypt for a time.

Myrrh was another of the gifts from the wise men to the infant Jesus (6, 18, 19, 23, 27, 30, 31, 35, 38, 60, 64).

Compositae

Carthamus tinctoria. This is a prickly, herbaceous plant, seldom more than two to four feet high, which yields safflower (also, carthamine or bastard saffron) and safflower oil. Opinion is divided as to the exact place of origin, but most authors seem to agree with Vavilov (61) that there were three (or, perhaps, any one of three) centers; India, Central Asia and

Abyssinia. *C. tinctoria* is virtually unknown in the wild state today (Theophrastus (58) and Pliny (43) say it grew both wild and under cultivation) and this greatly confuses attempts to locate its origin. It occurs today in many parts of the world, including Egypt. It is known that *C. tinctoria* was cultivated, too, in Ancient Egypt.

There is no evidence that safflower oil, which is pressed from the seeds, was used by the Egyptians, but there is much evidence that the dye was employed, especially in dyeing mummy wrappings and shrouds. *C. tinctoria* yields two dyes; red (carthamin) and yellow. The yellow is of limited usefulness because it is soluble in water. The dye is extracted from the florets which are gathered in dry weather as fast as they begin to open. These are dried, the yellow component extracted with water and the red residue, if not used immediately, is pressed into cakes (12, 27, 29, 30, 36, 57, 61, 64).

Cruciferae

Isatis tinctoria. This species is the source of woad, a blue dye almost completely indistinguishable from indigo. It has always been accepted that the blue dye of the Egyptians was indigo, from either *Indigofera tinctoria* (Indian indigo) or *Indigofera argenta* (silver indigo). *I. argenta* was favored because it had been cultivated in Egypt since the fourteenth century A.D. and grew wild in Nubia, Kordofan, Sennar, and Abyssinia. It is thought unlikely that the Egyptians obtained indigo from India (*I. tinctoria*) until a very late date. Lucas (29) points out that woad is the most likely source of Egyptian blue dye. According to him, woad was cultivated in the Fayum of Egypt in early Christian times and probably earlier. This would seem to give *Isatis tinctoria* priority over *Indigofera tinctoria.* The natural home of woad is not really known. It has been cultivated all across Western Asia, Southern Europe and England since early Christian and pre-Christian days and was used by the primitive Britons, according to Pliny and Ovid, to dye their bodies. *Isatis tinctoria* is only rarely cultivated today, having been almost replaced by indigo.

Isatis tinctoria is a handsome plant reaching a height of three to four feet and bearing rich yellow flowers. The dye is obtained from the leaves which are crushed and rolled into balls to dry. The balls are then powdered, wet again and allowed to ferment (the dye is not naturally present but is produced only by fermentation). After fermentation, the balls of woad are ready for use in dyeing.

Blue was usually used by the Egyptians on articles for the living, although at least one mummy wrapping exists which contains blue thread (2, 12, 27, 29, 36, 44, 45, 63).

Cucurbitaceae

Citrullus colocynthus. This is a climbing vine which bears a smooth, globular fruit about the size and color of an orange. The pulp of this fruit is soft and spongy and constitutes the colocynth ("bitter apple") of pharmacy. Colocynth is extremely bitter and poisonous, and is a drastic cathartic. It grows today throughout Western Asia and the Mediterranean region in general; also in several other parts of the world. In Palestine, Lebanon, Sinai, Egypt and Nubia, it grows wild in dry, sandy places and is very prolific. Apparently, it is native to this area of Western Asia and East Africa.

Pettigrew is, to my knowledge, the only writer to associate colocynth with embalming; he says it was an ingredient of one of the balsams used to prepare the dead. There is, however, mention (in an unknown connection) of colocynth oil (expressed from the seeds) in some papyri of the Graeco-Roman period (19, 27, 29, 35, 36, 38, 45).

Fagaceae

Quercus cerris. "Turkey oak" was proved definitely by the Kew Gardens to be the species from which the oak dowels in the shrines surrounding the sarcophagus of King Tut-ankh-amen were made. It grows today in the mountain forests in the Lebanon-Antilebanon region and may have been one of the oaks which, according to Theophrastus (58) and Pliny (43), grew in the vicinity of Thebes. Post (45) lists eleven species of oak growing in Syria, Palestine and Sinai and it is likely that the Egyptians also used species other than *Q. cerris* in various capacities (29, 42, 45).

Hamamelidaceae

Liquidambar orientalis. This tree is the Near Eastern source of the oleo-resin (and true balsam), storax (also called: styrax, liquid styrax, liquid storax, liquidambar). Chinese storax is obtained from *L. formosana* and American storax from *L. styraciflua.*

L. orientalis is native to Southwestern Asia Minor and it is rarely found outside that region today, although Tschirch and Stock (60) and Stuhlman (57) claim it may occur sporadically further east, i.e. around the Gulf of Alexandretta and Antioch. It is a medium-size tree, from 30-40 feet tall.

Storax is almost exclusively collected by a tribe of Turkish nomads called the Yuraks. They bruise the trunk of the tree and the balsam forms as a pathological reaction in the inner bark. The outer bark is scraped off and boiled in sea-water. The storax may then be skimmed off the top as it rises. For greater efficiency, the boiled bark is customarily pressed for still more yield of storax. The oleo-resin thus obtained is opaque, grayish and has a consistency approximating that of honey. It has a pungent, aromatic flavor and, on aging, acquires a pleasant balsamic odor. Storax has been used medicinally for many centuries, Pliny (43) having mentioned it in that capacity. It was used by the Egyptians, not only for embalming, but also in the preparation of ointments and perfumes. A piece of wood of *L. orientalis* was found in the eighteenth dynasty tomb of Tut-ankh-amen (19, 22, 27, 29, 30, 57, 60, 65).

Lauraceae

Cinnamomum cassia (Nees) Nees ex Blume and *Cinnamomum zeylanicum* Breyn. These are the sources of cassia and cinnamon respectively. The genus is native to Southeastern Asia and Malaysia. It does not exist in Africa or the Mediterranean area.

There is considerable doubt as to whether cinnamon and cassia were used in ancient Egypt and, if so, where they came from. The only evidence available of the use of cinnamon in dynastic Egypt (of an even slightly reliable nature) is the statement by Osburn quoted by Pettigrew (41) that on the surface of a twentieth dynasty mummy was ". . . a thick layer of spicery . . . (which) . . . still retains the faint smell of cinnamon or cassia." It may be noted that the odor of cinnamon is due to a constituent aldehyde, cinnamic aldehyde, and this is very susceptible to oxidation and volatilization so that it is, therefore, highly improbable that the odor could have persisted three thousand years.

There is, also, "evidence" in some of the ancient records. The oldest existing reference to cinnamon or cassia (they were frequently confused by ancient writers since they are very similar in many respects) is in the eighteenth dynasty Punt Reliefs wherein the loading of the vessels with, among other things, "cinnamon wood" is described. In the Karnak Reliefs of the nineteenth dynasty, it is written: "I gather together all the countries of Punt, all their tribute, of gum of myrrh, cinnamon . . ." And in the Papyrus Harris (twentieth dynasty) cinnamon is mentioned four times and cassia once in the lists of tributes.

It would thus appear that the ancient

Egyptians did have access to supplies of cinnamon and cassia. It is said that they were obtained in Punt which, in turn, must have received them from the Far East. But it is not so simple. There was no commerce between the Far East and Africa at so early a date. In 1500 B.C. (eighteenth dynasty), according to Laufer (25), Japan was not even in existence and China was yet a small inland agrarian community. China probably carried on no sea trade until about 200 B.C. Even though Laufer (25) proposes that Punt (or Egypt) received cinnamon and cassia from India or Ceylon instead of China or Indochina, there is still, according to W. S. Smith,* no real evidence of trade between Northeast Africa and the Far East until about the time of Alexander the Great in the third century B.C. There is considerable evidence that the two spices were to be had in Egypt, Greece, Palestine, etc., in the second and first centuries B.C., brought thence from India by the Phoenicians or Arabians. Strabo (56), writing in the first century B.C., mentioned India explicitly as a source of the spices.

It is very possible that the ancient records quoted above have been mistranslated; or, another alternative, as suggested by Fee (according to Laufer, 25) is that a fragrant bark, now extinct or unknown to us—perhaps a species of *Amyris*—once grew in Arabia or Ethiopia or both and it was to this that the ancient records refer.

It is extremely improbable, therefore, that the bark of *C. zeylanicum* or of *C. cassia* was ever employed by the ancient Egyptians in embalming or, indeed, that these two spices were even known to Egypt until the third or second century B.C., at which time Phoenician or Arabian traders, bringing the spices from India and/or Ceylon, introduced them to the entire Mediterranean area (6, 7, 8, 25, 29, 35, 39, 41, 49).

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*Personal communication.

Leguminosae

Acacia spp. . . Species of this genus are very numerous (about 420) and widely spread throughout the tropical and subtropical regions of the world; the majority are to be found about evenly divided between Australia and Africa, however. Post (45) lists eight species as indigenous to the Sinai-Syria-Palestine area and Muschler (36) mentions seven species growing in Egypt.

For many thousands of years *Acacia* spp. have supplied mankind with gum and timber. The timber is strong, elastic, naturally resistant to rot and fungal attack and although it is not easy to work, it was one of the earliest woods used by the Egyptians. According to the sixth dynasty Inscription of Uni: "His majesty sent me to Hatnub (middle Egypt) . . . (where) . . . I hewed for him a cargo-boat of acacia-wood." And later, "His majesty sent me to dig five canals in the South and to make three cargo-boats and four tow-boats of acacia wood of Wawat (in Nubia)." It would appear, then, that acacia timber was to be obtained in at least two places, both in the south, Middle Egypt and Nubia, which are known to have an indigenous growth of acacia.

Acacia is a small, thorny tree ranging in height from fifteen to thirty feet. but is sometimes stunted and shrubby. Its branches near the ground and the trunk may be as much as one foot in diameter. Not only is it an ancient source of timber, but it has also supplied the Egyptians with gum arabic (synonyms are based on the area of origin) since about the twelfth dynasty when it was reputedly used in making paints. Among other things, it also served to "stick" mummy wrappings.

Although many species of *Acacia* produce gum, today's main sources of gum arabic are *A. senegal* (L.) Willd. (*A. verek*), in the Anglo-Egyptian Sudan, and *A. arabica* (Lam.) Willd. var. *nilotica* (L.) Delile growing in Syria, Sinai, Egypt and south Ceylon, India, etc. . . .

The gum exudes naturally from the trunk of the tree, but this exudation is frequently abetted by breaking the bark without injuring the cambial layer or wood. The wound is at least two feet long. After three weeks to two months, there is sufficient exudation for gathering. The gum forms on the wound in large globular tears, soft at first, but gradually becoming hard. After picking, the tears are customarily bleached in the sun. Bleaching causes innumerable minute cracks to appear on the surface of the tear, giving it a characteristic opacity. Colors range from white through yellow and red depending on the source, species, method of preparation and many other factors. Gum arabic is used today in the textile, mucilage, paste, polish and confectionary industries and in medicine as an emulsifier and demulcent (5, 6, 18, 22, 29, 30, 32, 36, 45, 59).

Cassia acutifolia Del. Along with *Cassia angustifolia* Vahl., *Cassia acutifolia* is the source of true senna. *C. angustifolia* is native to Arabia and probably Africa and *C. acutifolia* is indigenous to the Anglo-Egyptian Sudan. Both species are straight, branched and about ten feet tall and both could have conceivably supplied the leaves from which senna, a cathartic of ancient usage, is derived.

However, its use as a cathartic dates only from the ninth century A.D. in Arabia and there is apparently no mention of senna in Egyptian records. The only suggestion that senna was used in embalming comes from Pettigrew (41), who claims that cassia and senna were components of "smyrea," a liquid used in the cheapest embalmings. We have seen the improbability that cassia was used and it appears likely that the same is true of senna. Pettigrew does not state his reason for believing that senna was a constituent of "smyrea" and it is extremely doubtful that it was used, in any capacity, in the embalming processes (30, 38, 41).

Dalbergia melanoxylon. "Ebony" may be the black heartwood of many kinds of tropical trees, but the "ebony" used in ancient Egypt (one might say the "true ebony" since the English word "ebony" is derived from the Egyptian "hebony") has been identified as *D. melanoxylon* (known today as African Blackwood). It is a small tree growing profusely in the scrub country and coastal regions of eastern Africa south of Egypt at least as far as Mozambique and Madagascar. African Blackwood is a dark, purple-plum color, very hard, close and free from pores. It is surprisingly easy to work and has long been a favorite material for the manufacture of clarinets, flutes, etc.

Ebony is mentioned often in Egyptian records as a material for the building of chests, shrines, coffins, etc., and although many articles of ebony have been found in tombs, there is yet to be discovered a coffin with even so much as dowels of ebony. Also, Egyptian records speak of ebony coming from Negro lands, Punt, Nubia, Genebteyew, Kush and the south countries, all of which are south of Egypt along the eastern coast of Africa. Apparently, the most ancient examples of ebony in Egypt are the small tablets and part of a cylinder seal from the first dynasty (1, 6, 21, 29, 57).

Linaceae

Linum is a large genus of herbs found in temperate and subtropical areas around the world. *L. usitatissimum* L., a cultigen, is the present-day source of flax. *L. angustifolium* Lodd., according to the majority of writers, is the parent of *L. usitatissimum* although there are others who claim that distinction for *L. perenne* L.

Flax has been under cultivation since prehistoric times, and there is naturally some doubt as to which species were (was) cultivated. Post (45) says *L. angustifolium* was cultivated prehistorically and that *L. usitatissimum* replaced it in more recent times; there is little quarrel with this conclusion. DeCandolle (12)

states that *L. usitatissimum* has been cultivated for at least four or five thousand years in Mesopotamia, Assyria and Egypt and that it was and still is wild between the Persian Gulf, the Caspian Sea, and the Black Sea. Indeed, it appears, according to Post (45), Vavilov (61), and others, that *L. usitatissimum* did originate in or around Mesopotamia. Vavilov also lists Central Asia and Abyssinia as centers of origin.

As for the origin of *L. angustifolium* itself, there can be even less certainty. It is found wild from the Canary Isles to Palestine and the Caucasus, and its seeds, capsules and the lower part of the plant have been identified in the remains of the Swiss Lake-dwellers' culture at Robenhausen.

The species cultivated by the Egyptians is likewise obscure. However, Unger (according to DeCandolle (12)) identified a capsule from a 13-14 century B.C. monument as resembling *L. usitatissimum* more than *L. angustifolium.* But there is really no reason to split hairs over this point. It is generally agreed that *L. usitatissimum* has been cultivated in Egypt at least since the beginning of the first dynasty and probably before. It is certainly conceivable that *L. angustifolium* was cultivated previous to the intrusion of *L. usitatissimum* and even that it persisted in cultivation, in at least some instances, for some time after the latter had gained dominance.

According to Ethel Lewis (26) the oldest existing fabric is of linen and this is certainly to be expected; the Egyptians have been weaving this textile for about six thousand years. They were the linen-makers *par excellance* of antiquity and produced cloth that ranged in quality from the very delicate to the very coarse. Egyptian techniques of linen-making are well described by T. Midgley (quoted by Lucas, 29). "The structure of textile fabrics of the earlier dynastic period in Egypt is now fairly well understood, and the character of the loom and its accessories equally well known. . . . From the tomb paintings . . . we have learnt how the flax stem was treated to obtain the bast fibers, how they were cleansed, heckled, roved, spun and warped. Finally, we have in these pictures the breast and warp beams shown pegged to the ground, lease rods and heddles inserted, and the weaving of cloth from carefully prepared yarns. No reed was used, so that . . . there is a great irregularity in the spacing of the warp threads as compared with modern fabrics; . . . Apart from this, it is singular how little within the range of plain weaving which is known today was not practised by the weavers of the Old Kingdom. . . . Thus at the very dawn of the historic period in Egypt we find the craft of the spinner and the weaver very highly developed in technique; manifestly the early stages of the evolution of the loom must be sought far back in the pre-dynastic era."

Linen manufacture was a large industry in Egypt and the Egyptians exported large quantities of it. The city of Apu was famous for its linen, and the city of Tanis was the center of linen manufacture in Lower Egypt. However, due to the large quantities exported, the industry must have flourished in other cities as well (7, 8, 12, 26, 29, 45, 61, 64).

Lythraceae

Lawsonia inermis (*Lawsonia alba*). This shrub is six to eight feet high and is widely distributed in the arid parts of north and east tropical Africa, Madagascar, tropical Asia and Australia. Most authorities believe that it originated in the East (Vavilov (6) says India) and spread early to the Mediterranean and Africa.

The leaves of *L. inermis* are dried, powdered and made into a paste called henna —a bright red, yellow or orange dye. The dye was and is used as a cosmetic and was probably used to stain the nails of mummies (although many writers feel that

stained nails could be due to the embalming materials) and, occasionally, to dye mummy wrappings.

The flowers are very fragrant and make an excellent perfume. It is likely that the Egyptians also employed the flowers in this capacity (8, 12, 27, 29, 30, 35, 36, 45, 61, 64).

Moraceae

Ficus sycomorus L. The "Egyptian fig tree" or "sycomore fig" is cultivated today in Egypt and may also be found along the eastern shore of the Mediterranean. That it grew in Palestine during Bible times, there can be little doubt; it is frequently referred to in the Bible (as "sycomore"). Strabo (56) says that it grew in Ethiopia and this would seem to be substantiated by several statements in ancient records which indicated that the sycomore fig was obtained in Punt (e.g. in the Papyrus Harris: "I planted incense and myrrh sycomores in thy great and august court in Ineb-Sebek, being those which my hands brought from the Country of God's-Land"). Theophrastus (58) states that the "sycomore fig" grows in Egypt and Lucas (29) seems to feel that the Egyptians had a domestic supply of the tree. Schweinfurth, according to Muschler (36), places the origin of *F. sycomorus* in Yemen just east across the Bab-el Madab straits from Punt.

F. sycomorus is an evergreen, growing to a height of 30-40 feet and sometimes attaining a trunk girth of 20 feet. The wood is very soft and porous, but is, nonetheless, very durable and was a great favorite with coffin-makers. Sycomore fig coffins have been discovered which date from the twelfth dynasty and up through the twenty-sixth dynasty. Remains of *F. sycomorus* have been found in predynastic graves (6, 29, 35, 36, 45).

Rhamnaceae

Zizyphus spp. This genus embodies about fifty species scattered about the tropics and subtropics of the world but found chiefly in Asia and America. The wood, sidder, found in a third dynasty plywood coffin and later as coffin dowels, was probably (according to Lucas (29)) obtained from *Z. mucronata* Wilbl. or *Z. spina-Chrisi* Lam., but the sidders are exceptionally difficult to differentiate even by microscopic examination. *Z. mucronata* is quite common in the drier parts of tropical and southern Africa and the Sudan and might have been used by the Egyptians except, according to Lucas (29), that there is no mention in ancient records of woods other than ebony and certain sweet and fragrant types having been brought from the south of Egypt. *Z spina-Christi* is probably the species used in coffin construction. It grows throughout the Mediterranean region including Egypt, the Levant and tropical Africa. It is a small tree, 9-15 feet tall, and thus too small to be extensively used in coffin construction, but it apparently grew in Egypt, was hard and durable and large enough for dowels.

The dried fruit of *Z. spina-Christi* has been found in predynastic remains. It may have been this part of the plant that was used in kyphi ointment (29, 30, 35, 36, 45).

Tamaricaceae

Tamarix spp. This genus contains about seventy species. They are numerous in temperate Asia and around the Mediterranean; Muschler (36) lists eight species growing in Egypt and Post (45) twelve in the Lebanon-Palestine-Sinai region. *Tamarix* (or tamarisk) is definitely indigenous to Egypt, stems and branches from the late Quartenary Period having been found in the Wadi Qena (29).

Tamarisk is a halophyte and may be found growing profusely in the salty deserts and along the sea coasts. The tree is usually straight and may range in height from a few to one hundred feet, but in the desert it is frequently a gnarled shrub. The wood is hard, tight, heavy and workable and was used for walking sticks, etc., as early as the Middle Kingdom. It did

not find its way into coffin construction until about the twentieth dynasty.

Tamarisk is mentioned ("tamarisk bundles") in the twentieth dynasty Papyrus Harris and Pliny (43) states that ". . . in Syria and Egypt this shrub is abundant." It is now generally supposed that the "manna" eaten by the Israelites during their trek from Egypt was the hardened, sweet sap of *Tamarix* spp. drawn off, predigested and exuded by aphids (4, 6, 9, 28, 29, 35, 36, 45, 53, 64).

Vitaceae

Vitis vinifera. The records of the cultivation of the grape and of the making of wine in Egypt go back five or six thousand years. Wide cultivation of the grape since ancient times complicates the problem of origin, but Vavilov (61) places it in the Near-Eastern center (interior of Asia Minor to Turkmenistan), DeCandolle (12) places it to the south of the Caucasus and Post (45) says ". . . its home is between the southern shores of the Caspian Sea and the Taurus."

V. vinifera grows today in Egypt, Lebanon and Palestine (and elsewhere) and *V. orientalis* may be found in Lebanon and Palestine. Although there can be no real certainty as to the species employed by the Egyptians in wine-making and as raisins which were used in kyphi ointment, it is generally conceded that it was *V. vinifera* (8, 12, 35, 36, 45, 61).

TABLE I
SUMMARY OF PLANTS MENTIONED IN THIS PAPER

NAME	PAGE	PART OR PRODUCT USED	USE
Abies cilicia Carr.	89	Exudate, wood	Embalming, coffins
Acacia spp.	98	Exudate, wood	Coffins, paints, adhesive
Allium cepa L.	92	Bulb	Religious, embalming (?)
Aloe succotrina Lam.	92	Exudate, fiber	Embalming (?), wrappings (?)
Boswellia spp.	93	Exudate	Embalming
Carthamus tinctoria L.	95	Floret	Dye
Cassia spp.	99	Leaf	Embalming (?)
Cedrus libani Loud.	89	Wood	Embalming, coffins
Cinnamomum spp.	97	Bark	Embalming (?)
Citrullus colocynthus (L.) Schrad.	96	Fruit	Embalming (?)
Commiphora spp.	95	Exudate	Embalming (?)
Crocus sativus L.	92	Stigma	Dye (?)
Cupressus sempervirens L.	89	Wood	Coffins
Cyperus papyrus L.	90	Pith of stem	Embalming
Dalbergia melanoxylon Guill. & Perr.	99	Wood	Coffins (?)
Evernia furfuracea (L.) Ach.	88	Whole plant	Embalming
Ficus sycomorus L.	101	Wood	Coffins
Isatis tinctoria L.	96	Leaf	Dye
Juniperus spp.	89	Wood, fruit	Coffins, embalming (?)
Lawsonia inermis L.	100	Leaf	Dye
Linum spp.	99	Fiber	Wrappings, embalming
Liquidambar orientalis Mill.	97	Exudate	Embalming
Phoenix dactylifera L.	93	Exudate	Embalming
Pinus halepensis Mill.	90	Exudate	Embalming
Pinus pinea L.	90	Exudate	Embalming
Pistacia lentiscus L.	93	Exudate	Embalming
Quercus cerris L.	97	Wood	Coffins
Tamarix spp.	101	Wood	Coffins
Taxus baccata L.	90	Wood	Coffins
Vitis vinifera L.	102	Fruit	Embalming
Zizyphus spp.	101	Wood, fruit (?)	Embalming (?), coffins

Appendix

CHRONOLOGY OF ANCIENT EGYPT
(after W. S. Smith. Ancient Egypt as Represented in the Museum of Fine Arts, 3rd ed., 1952)

Prehistoric:
- Pre-dynastic: 4000-3200 B.C.

Archaic Period: 3200-2680 B.C.
- Dynasty I: 3200-2980 B.C.
- Dynasty II: 2980-2780 B.C.
- Dynasty III: 2780-2680 B.C.

Old Kingdom. 2680-2258 B.C.
- Dynasty IV: 2780-2680 B.C.
- Dynasty V: 2565-2420 B.C.
- Dynasty VI: 2420-2258 B.C.

First Intermediate Period: 2258-2052 B.C.
- Dynasty VII: Interregnum
- Dynasty VIII: 2258-2232 B.C.
- Dynasty IX: 2232-2180 B.C.
- Dynasty X: 2180-2052 B.C.

Middle Kingdom: 2052-1786 B.C.
- Dynasty XI: 2052-1991 B.C.
- Dynasty XII: 1991-1786 B.C.

Second Intermediate Period: 1786-1570 B.C.
- Dynasties XIII-XIV: 1786-1680 B.C.
- Dynasties XV-XVI: 1720-1570 B.C.
- Dynasty XVII: 1600-1570 B.C.

New Kingdom: 1570-1085 B.C.
- Dynasty XVIII: 1570-1349 B.C.
- Dynasty XIX: 1349-1197 B.C.
- Dynasty XX: 1197-1085 B.C.

Period of Decline: 1085-663 B.C.
- Dynasty: XXI: 1085-950 B.C.
- Dynasty XXII: 950-730 B.C.
- Dynasty XXIII: 817 (?)-730 B.C.
- Dynasty XXIV: 730-715 B.C.
- Dynasty XXV: 751-663 B.C.

Saite Period: 663-525 B.C.
- Dynasty XXVI: 663-525 B.C.

Foreign Domination

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Milestones of Pharmaceutical Botany

Pre-history to 1900

*by Ara H. DerMarderosian**

THERE is little doubt that the task of presenting a review of milestones in pharmaceutical botany from pre-history to 1900 is a daunting and challenging task. However, even a cursory overview has value from the standpoint that looking back from the year 1995 can be a guide to where we have been and where we are going. Each period of history has its lessons and it will be my challenge to present a few of these from the past. By now, almost every culture around the world has had a chance to note their individual contributions to pharmacy and medicine. Articles abound on historical and archeological finds from many cultures on the beginnings of man's interest in plants as food and medicine.[1] In addition, major recurring themes and lessons in the history of pharmaceutical botany emerge even from a cursory review of historical events.

There were many early discoveries of a similar nature on pharmaceutical botany from all world cultures. The oldest prescriptions found on Babylonian clay tablets as well as the hieratic (priestly) writings of ancient Egypt on papyrus show the ancient medical uses of olive oil, wine, beer, yeast, vinegar, turpentine, figs, castor oil, myrrh, mastic, frankincense, wormwood, aloes, opium, cumin, peppermint, cassia, caraway, coriander, anise, fennel, saffron, lotus flowers, linseed, juniper berries, henbane, mandragora, poppy, gentian, colchicum, squill, cedar, elderberries, honey, grapes, onion, and date blossoms. There is little doubt that this botanical cornucopia represented the best collection of medicines from several cultures brought to bear on the ever enlarging and unifying peoples and their ills of the "wide" world at that time. Most cultures have ancient and still extant uses of similar plant medicines for similar disorders. Major useful and unique plants were widely and rapidly advanced to major use status (e.g., opium, castor oil, and aloe). Folkloric uses of phytomedicines persist worldwide.

*Professor of Pharmacognosy and Medicinal Chemistry, Philadelphia College of Pharmacy and Science, 600 South 43rd St., Philadelphia, PA 19104-4495.

Milestones

Archeological findings from 30,000 years ago in Shanidar in Iraq show pollen and plants that are still used in traditional medicine of these parts of Asia, e.g., yarrow, holly-hock, groundsel, grape hyacinth, St. Barnaby's thistle, and joint pine.

Throughout the ancient period major personalities documented the unique properties and uses of medicinal plants. The medical writings of the time included: the Code of Hammurabi (2250 B.C.); the Kahun papyrus

dealing with veterinary medicine (2000 B.C.); the Edwin Smith Papyrus for surgery and internal medicine (1600 B.C.); the Papyrus Ebers which deals with pharmacy, listing important plants in Egyptian medicine (at least 160), e.g., senna, poppy, colocynth, and castor oil (1552 B.C.). The Chinese *Pen-ts'ao* (Materia Medica) and related publications attributed to the mythical emperor Shen Nung and others which mention hundreds of plant drugs including ephedra (Ma huang), *Dichroa febrifuga*, and chaulmoogra oil (2000-1000 B.C.). In the Veda (books of knowledge) of India there were listed botanical prescriptions for "cures" for all the maladies of the time. The Susruta (1300 B.C.) gives myriads of drugs, e.g., opium, rauwolfia, nux vomica, aconite, and hashish. Other important figures whose writings were influential include Aristotle (360 B.C.); Theophrastus, the "father of botany," who wrote *De Historia Plantarum* (300 B.C.); and Mithridates, the King of Pontus and an early student of toxicology (80 B.C.). Around A.D. 60, Pedanius Dioscorides, physician in the time of Nero, traveled to Egypt, Africa, Spain, and Italy where he gathered information on botanicals and medicine (*De Materia Medica*). His work spread widely in the Roman and Arab world and exercised a great influence through the Middle Ages. It lists about 500 drugs of vegetable origin (e.g., pyrethrum, rue, scammony, squill, nutgall, and over 100 animal drugs). Galen, Rome's most celebrated physician wrote circa A.D. 150.

During the Middle Ages, religious orders propagated and preserved living plants in monastic gardens for use in medicine. A discussion of medicinal herbs can also be found in the writings of Alexander of Tralles, who used rhubarb, cantharides, and colchicum in medicine (550); the studies of Rhazes, head of the hospital at Baghdad and author of many studies on plants used in pharmacy (c. 875); the *Herbarium* of Apuleius Platonicus, one of the earliest manuscript herbals (950), as well as *Hortulus*, another herbal; the writings of Avicenna (c. 1000); the studies of Avenzoar who opposed the teachings of Galen (c. 1140); and the writings of Maimonides (c. 1160).

In the eleventh century A.D. the writings of Avicenna, Averroes, and other Arabs allied with data from India raised Arabic medicine to high levels. Through Spain, this spread all over Europe with many new medicines added, e.g., areca nut, cinnamon, musk, manna, nux vomica, tamarind, and camphor.

Milestones in history that affected the development of pharmaceutical botany include: the appearance of universities (e.g., Oxford in 1167 and Padua in 1222) and guilds (e.g., Guild of Pepperers in London, which included drug dealers, 1180); the works of Albertus Magnus on alchemy and Roger Bacon on predictions in science (1250); the books of Gerard of Cremona on translations of medical and pharmaceutical works (1260); and the travels of Marco Polo (1275) who revealed many of Asia's foods and medicines to Europeans.

The geographical discoveries of the sixteenth and seventeenth centuries brought new drugs (tobacco, cinchona, tea, and coffee) and opened a new era. The great maritime cities of Genoa, Venice, and Marseilles monopolized early modern European drug trade.

Also in the sixteenth century, we find Paracelsus, a Swiss physician, who is often considered the founder of pharmaco-chemistry. He was among the first to teach about extraction from drugs and the notion of active principles in plant medicines. A great number of drugs came to be added to old ones so that it became necessary to carry out vast revision of old drugs and undertake more exact studies of the new ones.

In sixteenth-century Europe we find the appearance of important herbals: Banckes (1525), *The Grete herball* (1526), Brunfels (1530) and Gerard (1597), which advanced phytomedicine; and the founding of famous botanical gardens such as those of Florence (1544), Bologna (1547), and Paris (1570); and the introduction of tobacco into Europe from the Americas by Nicot (1560).

Older prescription books, antidote books, and dispensaries led to pharmacopeias, official pharmaceutical codes for a city, state, or group of states. Vegetable drugs dominated these publications.

Important scientific developments of the early modern period include the first microscopic description of plant cells by Robert Hooke (1667) and related studies by Leeuwenhoeck (1673); the botanical explorations and establishment of Bartram's botanical

The frontispiece of this 1636 herbal shows the author's debt to the work of Theophrastus and Dioscorides in the study of plants and their uses.

garden in Philadelphia (1715); the concepts of classification and collections of Linnaeus (1740); Marggraf's isolation of sugar from beets (1747); Priestley's discovery of oxygen (1770), Cavendish's synthesizing water (1781), Withering's introduction of the infusion of digitalis into medicine (1785); and Johann Schoepf's publishing *Materia Medica Americana* (1787).

A more solid scientific basis emerged in the nineteenth century for the analysis and use of drugs found after isolation and study of their active principles: Scheele's separation of the first organic acids (oxalic, malic, and tartaric), Sertürner's isolation of morphine from opium (1805), Pelletier and Caventou's isolation of strychnine from nux vomica (1818) and quinine from cinchona (1820), Robiquet's isolation of caffeine from coffee (1820), Leroux's isolation of salicin from willow (1830), and Nativelle's crystallization of digitalin from foxglove (1869). As physiology developed, drug effects on animals and humans grew into pharmacology. The studies of Magendie (1809) on poisons of *Strychnos* on animals, and actions of ipecac and emetine

appear. Claude Bernard (1813-1888) developed drug assays using animals.

The increased need for specialization developed and disciplines started to separate from the primary sciences. Each area assumed the characteristics of autonomous subjects. The term pharmacognosy made its appearance in 1815 when C. A. Saydler adopted it in the title *Analecta Pharmacognostica*, a brief dissertation on some classical drugs published at Halle. Others adopted it until it replaced the older term, materia medica. Pharmacognosy developed into a focused study on the morphological and chemical characteristics of botanicals and other natural products. Based on earlier works by Phoebus, Wilbrand, Liebig, Merck, Buchheim, Schmiedeberg, Schleiden, Flückiger, and Hanbury, the well known Alexander Tschirch (1856-1939), Professor of Pharmacognosy in Bern published his monumental work *Handbuch der Pharmacognosie*, which extended the concept of this discipline and established the various branches to include cultivation and preparation, sources, packing, morphological systematics, anatomy, physiology, cytology, genetics, vegetable pathology, pharmacozoology (animal drugs), phytochemistry, physics, pharmaco-geography, history, ethnology, and etymology.

Leading from the nineteenth into the twentieth century, milestones include: the founding of the Philadelphia College of Pharmacy (1821); Wöhler synthesizing urea from ammonium cyanate and helping to eliminate distinctions between organic and inorganic chemistry (1828); Darwin publishing his *Origin of Species* (1859); Pasteur's studies in microbiology that bring an end to ideas of spontaneous generation and humoral medicine (1860-1880s); the beginning of the end of botanical patent medicine excesses with the Food and Drugs Act in the United States (1906)[1]; the contributions of John Uri Lloyd on the history of the vegetable drugs of the *U. S. Pharmacopeia* (1911)[2]; and the studies and botanical explorations of Henry Rusby (1880s).[3] Several recent texts have also reviewed botanical medicine,[4] and each has given valuable perspectives to this long and complex story. One recent article by De Pasquale has reviewed the history of pharmacognosy contending that it is the "oldest" modern science.[7]

Recurring Themes and Lessons

What can be drawn from these historical milestones? It is obvious that man from the earliest times recognized the value of certain vegetables, animals, and minerals as drugs or "tools." The recurring themes following from this are legion and continue to this day. Different cultures and nationalities of the world took "turns" at promoting various aspects of medicine through their own phytotherapeutics. In many cases folkloric practices were maintained (Asia and Europe) while others disdained those approaches (e.g., modern United States) through feelings of cultural and scientific arrogance based on early successes with pure isolated constituents from plants and some semisynthetic drugs. Few dispute the fact that knowledge of plant medicine is very old going now as far back as Shanidar. As societies advanced through the subsequent ages in the world, many dominant personalities in religion and science developed the concepts of influencing bodily functions through outside forces. Centuries later this led to the rational medicine of today with continuing elements of religion and the relatively new concepts of psychoneuroimmunology (PNI).

The widening world continues to recognize that discoveries come from everywhere. Most ancient cultures had similar plants which produced similar effects wherever they were used. The continuing study of ethnobotany shows the need to properly identify plants as to correct genus, species, and varieties and even chemovars. The early herbals gave way to modern color photography. Computers have now been brought into play to categorize and help identify plants. The complex phytochemistry of biologically active constituents have taught us that each plant is a veritable chemical factory. Early pharmacopeias, as today, tried to standardize botanical medicines. This was found to be difficult because of the variability of plants as to correct identification, proper collection, storage, transport and extraction for standardized dosage forms containing well characterized active principles. We now know that each constituent is produced by complex biosynthetic routes and often decades are needed to successfully ascertain which ones are present and which ones have specific pharmacological properties.

Often new physiological and pharmacological concepts were developed as new compounds and were recognized as "molecular keys." Older medicines and treatments have recycled, such as acupuncture when it was discovered that endorphin release occurred during its use and partly explained its value. The same was seen with capsaicin from hot peppers previously used as a counter irritant and now reintroduced because it is known to deplete newly discovered "substance P," which is involved in pain transmission.

There is a constant recycling of interest in nature as a source of new medicines. Throughout the rapid history presented here, there are many signs of re-interest in plants whenever a new active molecule is found. We now know that we are in a race with our pathogenic microbes to continuously find new antibiotics against them which they continuously have learned to overcome. New pandemic diseases such as AIDS, while disastrous now, do teach us about our immune system. Unique new anticancer principles from plants are sought continuously from nature and folklore.

Another view of all this history shows the human struggles for control over who runs the "medical machine." It took centuries for physicians, pharmacists, nurses, dietitians, and herbalists, to decide who is "in charge" and which medicines are best. We still see this today as modern economic conditions drive us to simpler and less expensive medicine. Some day it will truly be recognized that the control of disease is complex and that multidisciplinary modalities will always be needed for treatment. It is obvious that as people become more educated they will have to take on more responsibility for their own health problems guided by several professionals in the many areas of medicine. The current resurgence of alternative medicine is a good example where professional medical guidance is sorely needed to separate the "wheat from the chaff" on which modalities really work and why. We also need to recognize that human curiosity and "self-experimentation" will always be with us. Our fellow "guinea pigs" experimenting with untested herbs need to be counseled and records kept of their successes and adverse reactions.

The current herbal renaissance is a good example where ancient herbs and foods (e.g., garlic, ginseng, ginger, feverfew, and ginkgo) are being promoted as bona fide medicines and nutraceuticals. Perhaps through epidemiological approaches we can find if and how these work because the lack of a profit motive precludes focused industrial research on them. We need also to recognize that this may be the only relatively simple way we can ascertain the value of complex mixtures over single entities. The future is constantly shaped by both global and local events, which can be sociopolitical, environmental, or economic. These milestones foretell the need to pay attention to all these factors. All of us in science and medicine will have to vote intelligently and act professionally on major emerging issues such as overpopulation, pollution, overuse of limited resources, ozone depletion, ruination of rain forests, and the appropriate handling of the new found freedoms of countries formerly associated with communism.

This cursory view of botanical and medical milestones hopefully will serve as a continuing guide to future advancement as we rediscover anew each generation, the extensive lessons of the past and their appropriate application to future problems.

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Theophrastus on Herbals and Herbal Remedies

JOHN SCARBOROUGH

Department of History, University of Kentucky
Lexington, Kentucky 40506

Theophrastus of Eresos (c. 370-288/85 B.C.) was the outstanding student of Aristotle, and is famed in the history of Western literature for his lampooning *Characters*, as well as numerous treatises on botany, petrology, and other subjects in natural history.[1] Best known is the *Historia Plantarum*, which formed the base for all succeeding studies of plant lore and classification until the Linnaean system.[2] Taking Aristotle's methodologies, illustrated in the *Historia Animalium*, *De Partibus Animalium*, and other zoological works, Theophrastus produced a botanical guide that displayed the best in the Peripatetic approaches to the world of nature.

There is some controversy over the authenticity of *Historia Plantarum*, IX, in which herbs and herbals appear. It is argued that there may be some genuine "Theophrastean" matter in Book IX, but that an unknown *rhizotomos* ("root-cutter") was the author.[3] In a recent survey of herbal documents, Stannard remains uncertain about Book IX, and his conclusion that "Book IX of Theophrastus' *History of Plants* ... is possibly spurious"[4] is typical of most essays touching on the subject. The problem is centered on the topics in Book IX, which seem at variance with the remainder of the treatise, but Einarson has shown that the best witnesses in the MS tradition do include Book IX.[5] Further-

1. The best summary is O. Regenbogen, "Theophrastos," *Real-Encyclopädie der classichen Altertumswissenschaft* suppl. VII (Stuttgart, 1940), cols. 1354-1562 (1435-1479: botany); this work is hereafter cited as *RE*.

2. The first edition of Carl Linnaeus's *Species Plantarum* appeared in 1753. A two-volume facsimile edition has been published (London: The Ray Society, 1957-1959), with extremely useful introductions and appendices by John L. Heller and W. T. Stearn. See also John L. Heller, "The Early History of Binomial Nomenclature," *Huntia, 1* (1964), 33-70.

3. Hugo Bretzl, *Botanische Forschungen des Alexanderzuges* (Leipzig: Teubner, 1903), p. 366 and n. 24.

4. Jerry Stannard, "The Herbal as a Medical Document," *Bull. Hist. Med., 43* (1969), 213.

5. Benedict Einarson, "The Manuscripts of Theophrastus' *Historia Plantarum*," *Class. Phil., 71* (1976), 67-76, esp. 68-69 with U*.

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more many doubts about the textual contents of Book IX result from the state of corruption, interpolation, and omission in the MSS, especially those sections after IX, 18.

According to the usual definition of "herbal," Book IX of the *Historia Plantarum* would not qualify as one in *isolation* from the remainder of the work. Descriptions of the various plants are detailed in the main body of the treatise, while their medical properties are singled out in Book IX. But if Book IX is taken together with the previous descriptions, – it does fall under the definition given by Lawrence: "a book on plants of real or alleged medicinal properties, which describes the appearance of those plants, and provides information on their medicinal importance and use."[6] Book IX qualifies as an herbal; in fact it is the earliest herbal in Greek that has come down almost complete.

In the introduction to his edition of Theophrastus's *De Lapidibus*, Eichholz writes, "Theophrastus . . . mentions the medical properties of no earths, and of only one stone . . . Similarly, he excluded pharmacology from his treatise on plants."[7] Likewise, one reads in the standard *Kremers and Urdang's History of Pharmacy* that Theophrastus "was primarily a botanist," and that Dioscorides was "the first to deal with medical botany."[8] Whatever one may believe about the authenticity of Book IX of the *Historia Plantarum*, there is ample evidence in the rest of the work, and in *De Causis Plantarum*, that attests to Theophrastus's great interest in medicinals, and plant medicinals in particular. Omitting *Historia Plantarum* IX from consideration of the Theophrastean *corpus* does grave injustice to the history of ancient botany and ancient pharmacy: here are medicinals, derived from plants – and one animal. Moreover, Theophrastus assimilated much information from the writings of Diocles of Carystos (fl. in the time of Aristotle, 384-322 B.C.),[9] a

6. George H. M. Lawrence, "Herbals: Their History and Significance," in *History of Botany* (Los Angeles: University of California Press, 1965), p. 3; quoted in Stannard, "Herbal," p. 213.

7. D. E. Eichholz, ed., *Theophrastus: De Lapidibus* (Oxford: Clarendon Press, 1965), p. 7 and n. 2.

8. Glenn Sonnedecker, rev., *Kremers and Urdang's History of Pharmacy*, 3rd ed. (Philadelphia: Lippincott, 1963), p. 15.

9. Werner Jaeger, *Diokles von Karystos* (Berlin: De Gruyter, 1963), esp. pp. 114-123. Fragments of lost Theophrastean writings suggest a deep interest in medicine and pharmacology. Regenbogen, "Theophrastos," cols. 1426-1434, esp. col. 1427, nr. 3. F. Wimmer, ed., *Theophrasti Eresii: Opera* (Paris: Didot, 1866, reprint of Teubner, ed., 1854-1862), collects a number of fragments (incomplete) that illustrate this diversity of interest. Two examples among many will serve to demonstrate the "medical" aspects. Frag. 117 (Wimmer, p. 445) is from

physician who lived in Athens, and this puts Theophrastus in context with some of the important developments in Greek medicine and anatomy. Diocles was not one of the local *rhizotomoi* ("root-cutters"),[10] but a doctor who left a reputation for dissection and medical investigation of all kinds.[11] The list of Diocles' works is wide-ranging, and includes those on drugs.

Theophrastus tells us that he has procured much information from the *pharmacopōlai* ("drug-vendors") and *rhizotomoi*,[12] but Wellmann has shown that some basic medical data in *Historia Plantarum* IX came from the works of Diocles.[13] Theophrastus and Dioscorides,[14] as well as Apollodorus/Nicander,[15] used Diocles' materials on plants as medicinals. A number of fragments, collected by Wellmann,[16] clearly indicate Diocles' abilities; several of these fragments prove that Diocles' observa-

Athenaeus, X, 429b, on how Theophrastus records (in an untitled work) that Miletus had a custom that women drink water, but no wine; earlier the fragment records that one suffered death for drinking unmixed wine if he did so without a doctor's prescription to effect a cure. Frag. 178 (Wimmer, p. 461) is from Theophrastus's *Biting and Venomous Animals* and *Animals That Live in Holes* (the electric ray fish) = Athenaeus, VII, 314b-c. Galen (ed. C. G. Kühn), VI, 190 = K. Koch, ed., *Galeni De Santitate Tuenda* (Leipzig: Teubner, 1923 [*Corpus Medicorum Graecorum*, V, 4. 2]), III, 5.2-3 (Koch, p. 84), says that Theophrastus wrote a book (possibly titled *On Fatigue*) wherein gymnastics and medicine were combined.

10. M. Wellmann, *Die Fragmente der sikilischen Ärzte Akron, Philistion und des Diokles von Karystos* (Berlin: Weidmann, 1901), pp. 117-207 (fragments), as contrasted with the statement in *Kremers and Urdang's History of Pharmacy*, p. 15.

11. Wellmann, *Fragmente*, p. 117 (list of titles).

12. *Historia Plantarum*, IX, 8 passim; 11.7 and 9; 15.2; 16.3; 18.3 and 10; 20.4; henceforth this work is cited as *HP*.

13. Max Wellmann, "Das älteste Kräuterbuch der Griechen," in *Festgabe für Franz Susemihl* (Leipzig: Teubner, 1898), pp. 1-31, esp. pp. 22-31.

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15. It is quite clear that Nicander had no competence in the subject matter of the two extant poems, *Theriaca* and *Alexipharmaca*; he borrowed (and mangled) the data in the works of Apollodorus (fl. sometime in the third century B.C.), who, in turn had borrowed some of the materials from the works of Diocles. M. Wellmann, "Apollodoros," *RE*, I, pt. 2 (Stuttgart, 1894), nr. 69, col. 2895. Franz Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit*, 2 vols. (Leipzig: Teubner, 1891-1892), I, 784-785. John Scarborough, "Nicander's Toxicology, I: Snakes," *Pharm. Hist.*, *19* (1977), 3-23.

16. Wellmann, *Fragmente*, p. 117.

tions on pharmacology and plant medicinals were embedded in Theophrastus's works, especially Book IX of *Historia Plantarum.*[17]

Diocles' and Theophrastus's herbals, however, are far simpler than the multisubstance remedies that would be preserved by Nicander, Dioscorides, Galen, and later writers in Greek and Roman pharmacology. Moreover, Theophrastus seems uncertain about the definition of "herbal" as his sources of information had given it to him. Implicitly, silphium, frankincense, and myrrh do not form part of Theophrastus's medicinals,[18] although he does give myrrh as part of one of the few multisubstance remedies in the short *On Odors* (35). Once he has given his description of frankincense and myrrh, he attempts a definition of herbs (*poai*), which will include juices (*opoi*) not described previously.[19] These will be those substances which have "medical powers,"[20] and will comprise "extracted juice" (*chylismos*), "fruits" (*karpoi*), "leaves" (*phylla*), and "roots" (*rhiza*), because the *rhizotomoi* call "herbs medicinals,"[21] and they consist of these parts. This hesitant definition of "herb" may have been borrowed from Diocles or the *rhizotomoi*, but Theophrastus may have invented it on his own. The *rhizotomoi* had given him a piece of his basic information, because the *rhizotomoi* do not call all their roots herbs, but only those from the class of medicinals, or healing plants, or healing parts of certain plants.[22] Theophrastus still seems uncertain of his definition, because he continues by distinguishing those potencies (or "powers" [*dynameis*]) of roots which are general from those *dynameis* in roots which have use in healing or medicinals (*pharmakōdeis*). Thus roots which are medicinal include all four parts of the plant, especially the leaves, as root-cutters themselves say; consequently, "herbs" are all four parts, not just the roots.[23] Theoprastus gives full credit to the *rhizotomoi* and their imprecise descriptions, but he attempts to put some kind of label on their empirical

17. Ibid., nr. 150 (p. 191, from *Rootcutters*): *Scholia on Theriaca*, 628, compared with Nicander, *Theriaca*, 628, Dioscorides, *Materia Medica* (ed. M. Wellmann), III, 31 and 49, and Theophrastus, *HP*, IX, 11.1. nr. 152 (pp. 191-192, from *Rootcutters*): Erotian, *s.v.* σησαμοειδές (120, 6 Kl.) with Dioscorides, IV, 149, Rufus in Oribasius, II, 109, Strabo, IX, 418, and Theophrastus, *HP*, IX, 9.2. See also nrs. 156, 160, and 166 (the last from Theophrastus, *On Stones*).

18. *HP*, IX, 1 and 4.

19. Ibid., 8.1.

20. Ibid., *φαρμακώδεις δύναμεις.*

21. Ibid., *καλοῦσι γὰρ καὶ πόαν ἔνια τῶν φαρμακωδῶν οἱ ῥιζοτόμοι.*

22. Ibid., 8.2.

23. Ibid., *τῶν δὲ ῥιζῶν πλείους μὲν εἰσιν αἱ δύναμεις καὶ πρὸς πλείω.*

notions. What follow are "herbs," and only a few "herbals": plants are listed with only an occasional combination with other plants; yet his "herbs" are "herbals," because the medicinal properties of each plant are assumed to act singularly, most often with water, honey, and olive oil.

Lists of beneficial and harmful plants and extracts are as old as civilization, and the *Syriac Book of Medicines* suggests, as one example, how such listings became jumbled together over millennia.[24] Budge quotes from the Assyrian Kuyûnjik Collection a description of how Sennacherib (705-681 B.C.) "planted . . . all the herbs of the land of Khatti,"[25] and shows how many of these early prescriptions became embedded in later compilations that came to include Greek and Roman authors.[26] Among the Greeks is Diocles of Carystos,[27] along with a host of other authorities, both very ancient and quite recent.[28] Contained in the *Syriac Book of Medicines* are many folk traditions, side by side with the conclusions of the best Greek and Roman doctors and pharmacologists. So also Theophrastus has inherited a long history of empirical observation, which he records in Book IX of *Historia Plantarum*, but he puts these notions about "herbs" into the Peripatetic framework and classification system, which had served so well in the first eight books of *Historia Plantarum*, as well as in *De Causis Plantarum*. Each herb that is listed in Book IX meets his definition of "medicinal," as he has set it down in IX, 8.1 and 2, and sometimes that definition will lead Theophrastus to include nonbotanical matter.

Unlike the muddled nomenclature of snakes,[29] spiders, certain minerals,[30] insects, and other animals that might be employed in medicine, or that might be mentioned in the Greek texts of medicine and pharmacology, plant nomenclature is slightly more assured. A multitude of names was applied to poisonous snakes, for example, while plant names

24. E. A. Wallis Budge, ed. and trans., *Syrian Anatomy, Pathology, and Therapeutics, or "The Book of Medicines,"* 2 vols. (London: Oxford University Press, 1913).

25. Ibid., I, cxlviii.

26. The list includes Asclepiades of Bithynia, Galen, Hippocrates, Diocles, and several others.

27. *Syrian Anatomy*, I, 19-20 (Syriac text) and II, 18-19 (translation). Wellmann, *Fragmente*, could not include this Syriac fragment in his collection.

28. *Syrian Anatomy*, I, clxix-clxxi (summary of prescriptions that have association with famous physicians).

29. Scarborough, "Nicander's Toxicology," pp. 3-23.

30. John Scarborough, "The Drug Lore of Asclepiades of Bithynia," *Pharm. Hist.*, *17* (1975), 43-57 (49: *nitron*; 53-54: Sal Ammoniac).

in Theophrastus, Nicander, Dioscorides, Galen, and others have some consistency that helps in modern identification. Specific plants had names recognized throughout the Greek world, and where there is doubt, modern Greek sometimes preserves an essential word or core that helps key modern nomenclature.[31] Once a plant is keyed, one may determine through modern biochemistry and pharmacology if the substance had beneficial or harmful effects. Quite often, empirical observation as recorded by Theophrastus or Diocles is correct, although the manner of description fits the Peripatetic mold.[32]

In keeping with the traditions of Greek agriculture, as well as the structure of the entire *Historia Plantarum,*[33] Theophrastus describes how these useful medicinals will be gathered: by season and by method. The best juices are collected in the summer, while the most useful roots are gathered at the time of the wheat harvest (spring) or after the rising of Arcturus (autumn), when the plants "have lost their leaves or fruit."[34] Part of the method of gathering juices includes the part of the plant: stalk, root, and head. Juices from the stalks come from most plants, examples being wild lettuce and spurge. Theophrastus provides no examples for the class of "root-juices," perhaps in keeping with his previous definition of the "root" as the "whole" plant. The poppy (*mēkōn*) yields it juice from the head, the only plant so treated.[35] Subsumed under method of collection, following season and parts, are the actual procedures used in collecting: incisions, bruising, and cutting. Those plants with an abundance of juice have their sap collected into jars or vessels made for the purpose; probably Theophrastus implies this method for those plants that yield juice from their stalks. Those plants having little sap from the stalks had their juice absorbed into a ball of wool, as with *thridakinē* (*Lactuca scariola* L., "wild lettuce").[36] In the bruise method, the plants were cut down, water was poured over them, the fluid was strained, and the sediment retained.[37] This was the method

31. R. M. Dawkins, "The Semantics of Greek Names for Plants," *J. Hellenic Stud.*, *56* (1936), 1-11.

32. Pseudo-Aristotle, *Problems*, I, esp. 41, is a good parallel example.

33. Theophrastus valued – and named – the following agricultural writers: Chartodras, Androtion, and Satyrus. See note 142, below.

34. *HP*, IX, 8.2. *Cf.* Hesiod, *Works and Days*, 248.

35. *HP*, IX, 8.2.

36. *HP*, VII, 6.2 ("wild" lettuce). Theophrastus recognized several types of "wild lettuce" (*HP*, VII, 4.1 and 5). Θρῖδαξ (*Lactuca sativa* L.) is "lettuce" (*HP*, VII, 4.2 and 9).

37. *HP*, IX, 8.3, with Dioscorides, III, 7.

employed with the "roots" of hemlock (*kōnion*), which were thought to be more potent than the fruit,[38] and with *thapsia* (*Thapsia garganica* L., "deadly carrot").[39] In the cutting method, there was no variety, except in the seasons, either summer or autumn; hellebore is given as the example: the slender lower roots were taken, because the thick upper ones were considered useless.[40] Theophrastus does not distinguish which *helleboros* he means in this passage.

Before Theophrastus begins to list his "herbals," he prefaces the listing with some statements of the *pharmakopōlai* ("drug-vendors") and the *rhizotomoi*. This section (*Historia Plantarum*, IX, 8.5-8) illustrates quite vividly Theophrastus's sources of information, other than Diocles. The drug-vendors and root-cutters advise that one should cut roots only when standing to the windward, especially for *thapsia*; furthermore, one should oil his body first, before cutting the roots. The rest of IX, 8.5-8 is filled with more popular notions, folklore attending the occupations of root-cutting and drug-pandering.[41] These sources of information fit Theophrastus's ideas of gathering empirical knowledge, and he was interested "in things which are called fairy-tales by earlier thinkers."[42] He labeled these ideas as probably less than reliable, but included them because they had yet to be tested and apparently were useful to the *rhizotomoi* and *pharmacopōlai* in their work. That "use" can be placed within the doctrines of sympathy, which seemed to gain popularity in the fourth century B.C.,[43] and which moved the perception of *pharmaka* back into the pesudo-divine context they had had in Homer.[44] If Edelstein's contention is correct, *pharmaka* had been divested of their "magical" and "divine" nature in the Greek writings from c. 700 B.C. to the time of Theophrastus.[45] The new age of wide-ranging military ventures, and of new knowledge from the "far" East, was an age that seemed more willing to attribute multiple meanings and

38. *Cf.* Rufus in Oribasius, VII, 26.125, and Archigenes, Ibid., VIII, 2.30.

39. *HP*, IX, 8.3. Cf. IV, 153 (Θάψια). Dioscorides, IV, 153.2, notes that one had best dig it up only when there is no wind, because the root gives blisters. Cf. Pseudo-Aristotle, *Problems*, I, 41 [864a6].

40. *HP*, IX, 8.4: φάσιν.

41. *HP*, IX, 8.5-8.

42. Ludwig Edelstein, "Greek Medicine in Its Relation to Religion and Magic," *Bull. Hist. Med.*, *5* (1937), 201-246; reprinted in Owsei and C. Lilian Temkin, eds., *Ancient Medicine: Selected Papers of Ludwig Edelstein* (Baltimore: Johns Hopkins Press, 1967), pp. 205-246.

43. Pseudo-Aristotle, *Problems*, 886a24. Theophrastus, *On Odors*, 63.

44. *Odyssey*, IV, 230, among many references.

45. Edelstein, "Greek Medicine," pp. 233-235.

powers to *pharmaka*. Much later, Galen would reflect this change,[46] as does Pseudo-Aristotle in *Problems*,[47] probably set down in the generation of Theophrastus. Thus Theophrastus's herbs emerge from a wider context than simply the observations of Diocles: the root-cutters and drug-sellers are assumed to have information that would help provide full description and analysis of the plants. Their medical properties seem not to have been appreciated before Diocles and Theophrastus (the Hippocratic tradition avoids any "sympathetic" description of plants and derived drugs),[48] and *Historia Plantarum* IX is exactly the place one would expect to find plant medicinals.

Mandragoras (Mandrake [*Atropa mandragora* L., or *M. officinalis* L.; U.S. sp. *Podophyllum peltatum* L.])[49] is the first herb on Theophrastus's list (IX, 9.1). Its leaf is to be mixed with barley meal to make a poultice, and is beneficial on wounds. The root, scraped and soaked in vinegar, is deemed useful for erysipelas; also the root(?) is used as a remedy for gout, as a sleep inducer, for "potions" (*philtra*), and is given in "wine or vinegar." One prepares the root by cutting it into little balls (like radishes),[50] stringing them over new wine, and then hanging them over a fire to be smoked.[51]

Mandragoras is in Dioscorides,[52] Galen,[53] and Oribasius,[54] but not in Nicander. Similar to Theophrastus's "sleep inducer" is Galen's "pain killer."[55] The active principles in mandrake are podophyllotoxin, as well as picropodophyllin, and several peltatins. Medically, the effect of mandrake is quite similar to that of stramonium (*Datura stramonium* L.) and belladonna (*Atropa belladonna* L.), and produces lethargy. In modern times, mandrake is employed as an antispasmodic for dogs in veterinary practice, but is no longer recommended as a cathartic in

46. John Scarborough, *Roman Medicine* (London: Thames and Hudson, 1969), pp. 135 and 216, nn. 78-83 (astrology).

47. See note 43, above.

48. Edelstein, "Greek Medicine," p. 234.

49. It is unlikely that this is the Indian podophyllum (*Podophyllum emodi* Wall.), from the Himalaya Mountains and Kashmir.

50. Cf. *HP*, IX, 12.1.

51. Cf. Dioscorides, III, 7; IV, 75; and V, 71. *HP*, IX, 8.8.

52. Esp. IV, 75.

53. XI, 751 and 767, among many references.

54. Oribasius, XI, M.3 (cf. Dioscorides, IV, 75); J. Raeder, ed., *Oribasii Collectionum Medicarum Reliquiae*, 4 vols. (Leipzig: Teubner, 1928-1933 [*Corpus Medicorum Graecorum*, VI, 1, 2]), II, 119-120 (= XI, M.3).

55. Galen, X, 816 (= *Method of Medicine*, XII, 1): *ἐν τοῖς καλουμένοις ἀνωδύνοις φαρμάκοις*, among which is listed *μανδραγόρου ῥίζης*.

general medicine. Theophrastus's sources knew that the pain from gout would be alleviated with a mandrake "potion," but any beneficial effects in the treatment of erysipelas would come from the mild antibiotic action of wine or vinegar (if applied externally) against Group A hemolytic streptococci. Possibly the mandrake drink would have helped victims of erysipelas who had developed secondary symptoms.

Next comes *helleboros* (IX, 9.2), with a very cryptic summary that says simply "both the root and fruit are useful" as a purge. Shortly (IX, 10.1-3), Theophrastus adds a little more about *helleboros*, noting that there are two kinds, black and white; black is fatal to horses; white is eaten by sheep and thereby purged; white *helleboros* grows in the vineyards of Elea, and is used there to make a very diuretic wine. In IX, 14.1-4, we read that *Helleboros* (its "prepared" name is *sēsamōdē*)[56] keeps a long time, almost infinitely without losing its effectiveness, and in IX, 8.4, *helleboros* appears as part of the general description of "root-cutting."[57] By contrast, Diocorides has a lengthy description,[58] replete with superstitions, and Galen mentions *helleboros* as emerging from the Hippocratic writings,[59] as well as from the books of Archigenes.[60] It is curious that Theophrastus gives such short shrift to *helleboros*, unless he intends not to speak at length about those plants known to be deleterious. A related oddity is Nicander's omission of *helleboros* in both the *Theriaca* and *Alexipharmaca*; again this may be due to the influence of Diocles' original work, employed by Apollodorus, and in turn purloined by Nicander.[61]

Black *helleboros* is *Helleboros niger* L., and white *helleboros* is *Veratrum album* L. (U.S. sp. *Veratrum viride*, Ait., "green hellobore"). An alkaloid, cevadine, is contained in the root, which is also part of what is known as veratrine mixture, gained from the seeds of *Schoenocaulon officinale* (Lindl.) A. Gray. No longer used as an anodyne counterirritant, cevadine extract (as part of veratrine) is used in veterinary

56. Dioscorides, IV, 162.1: *καὶ ἐν Ἀντικύρᾳ σησαμοειδές, χρώμενοι πρὸς τὰς καθάρσεις αὐτῷ.*

57. See *HP*, IV, 5.1; VI, 2.9, for description; *De Causis Plantarum* (ed. Wimmer), VI, 13.4, for general qualities. See also *HP*, IX, 15.5 (Arcadia).

58. Dioscorides, IV, 148; 149; and 162. Virgil, *Georgics*, III, 451. See Elfriede Abbe, *The Plants of Virgil's Georgics* (Ithaca: Cornell University Press, 1965), pp. 49-50.

59. Galen, XI, 874 = *Blendings and Dynameis of Simple Medicines*, VI, 5.9.

60. Galen, XVI, 124 (Archigenes); XIV, 761 (antidote for hellebore); XIX, 739 and 744 ("black" hellebore); XIX, 744 ("white" hellebore); among many references.

61. Scarborough, "Nicander's Toxicology," pp. 3-23.

medicine as an emetic for pigs and cattle. Theophrastus does not specify what he means by "purge," but an administration of hellebore would promote heavy vomiting. Theophrastus's sources knew the dangers of hellebore, illustrated in an anecdote about a drug-vendor and a shepherd (IX, 17.1). A *Pharmakopōlēs* was impressing many by his ability to eat without harm "one or two roots" of hellebore, when a local shepherd came up and ate *all* the drug-vendor's supply without ill-effect. One could, therefore, build up a resistance to hellebore (any shepherd knew this), and the incident destroyed the drug-seller's reputation. Furthermore, Theophrastus adds that Thrasyas (otherwise unknown) could consume hellebore without harm, and that a certain Eudemus of Chios could drink hellebore and survive, because he had an "aid."[62] This turns out to be pumice (*kissēris*). It appears that toxicology had not emerged as a separate series of observations, except incidentally.[63] It is clear, however,that Theophrastus was aware that hellebore was quite toxic.

Following the clipped notice about hellebore, the same section (IX, 9.1) has a listing of uses for *panakes* (probably "all heal"). This passage seems badly corrupted, and any firm identification of the plant must await a critical text.[64] Perhaps of the *Valerium* spp., or *Ferulago*, the fruit was useful in treating miscarriage, as well as micturation problems (*tas dysourias*). Other references in Dioscorides (I, 6), Rufus in Oribasius (VIII, 24.6), and the Hippocratic *Aphorisms* (III, 31) do not help key the plant, because other suggestions are made for urination problems. The juice of the *panakes* also is useful in treating miscarriage, for sprains, the voice, and "for the ears." The root is beneficial for other problems of women (unspecified),[65] and for flatulence in beasts of burden.[66] Lastly, *panakes* is useful in making perfume (as in *Historia Plantarium*, IX, 7.2). One might hope that the further listing of *panakes* in IX, 11.1-4 would help to key either the full list of four "kinds" or the specific species. The *panakes* in IX, 9.2, is now called "Syrian,"

62. *HP*, IX, 17.3: *ἡ βοήθεια*.

63. Scarborough, "Nicander's Toxicology," pp. 3-7.

64. Sir Arthur Hort, ed. and trans., *Theophrastus: Enquiry into Plants*, 2 vols. (London: Heinemann, 1916 [Loeb Classical Library]), II, 468, states *Ferulago galbanifera*.

65. Πάνακες in the Hippocratic *corpus* (ed. E. Littré), VIII, 387, is recommended in treatment for displacement of the uterus; Littré thinks the plant is *Echinophora tenuifolia*. Soranus, *Gynecology* (ed. J. Ilberg [Leipzig: Teubner, 1927; *Corpus Medicorum Graecorum*, IV]), I, 19.62: *πάνακος ῥίζης* is a contraceptive.

66. This seems to be an echo of Aristotle, *Historia Animalium*, 604a12: *πρὸς ὑποζυγίων φύσας*.

and in IX, 11.1-3, we get three more "kinds:" "Chaeronean," *panakes* of Asclepius, and *panakes* of Heracles. "Chaeronean" may be from the *Inula* spp., and Theophrastus writes that this plant is most effective against the bites of spiders, snakes, and other reptiles. One gives "Chaeronean" in the following ways: in wine, in olive oil (smearing the wound), in a plaster, in vinegar, and with honey (for tumors: *phymatōn*). Nicander, *Theriaca*, 130, 223, and 826, and Oppian, *Cynegetica*, III, 439, allude to the snakebite, but the type of *panakes* (Nicander, *Theriaca*, 565) is quite different. The third on Theophrastus's list of *panakes* is the *panakes* of Asclepius (IX, 11.2), which appears in Nicander, *Theriaca*, 685, as *panakes Phlegyeion.*[67] Perhaps this is one of the *Ferula* spp., and Theophrastus says to scrape the leaf and stem (which taste salty: *halykōdē*) into an unnamed drink for benefit against snakebite. There are other uses: mix it with honey for disorders of the spleen, when blood accumulates around it; pound it up (root? leaf?) with olive oil, and anoint the head to cure headache; take scrapings in wine for stomachache; sprinkle it on a "wet" or "running" wound (*tōn helkōn tōn men hygrōn*) in hot wine (wash the wound first); apply a plaster of it, soaked in wine, for dry wounds. Again the major benefit would come from the lightly antibiotic qualities of wine, or from a similar effect in the honey mixture.[68]

The fourth *panakes* (*Historia Plantarum*, IX, 11.3) can be keyed, thanks to a reference in Dioscorides (III, 48.1). This is the *panakes* of Heracles, from which – so Dioscorides tells us – is extracted *opopanax*. Opopanax is a fetid gum resin, obtained from the roots of *opopanax Chironium* (L.) Koch, a yellow-flowered umbelliferous plant that resembles the parsnip;[69] opopanax was formerly used in perfumes and soaps.

67. *ἄγρει καὶ πάνακες φλεγυήιον, ὅ ῥά τε πρῶτος / Παιήων Μέλανος ποταμοῦ παρὰ χεῖλος ἄμεβξεν.* A. S. F. Gow and A. F. Scholfield, *Nicander* (Cambridge: Cambridge University Press, 1953), p. 234, identify the plant as *Echinophora tenuifolia*. See Dioscorides, III, 49.

68. On wine as an antiseptic, see Guido Majno, *The Healing Hand: Man and Wound in the Ancient World* (Cambridge, Mass.: Harvard University Press, 1975), p. 187: "The antiseptic power of wine is no myth . . . Recent studies . . . pin down the mechanism to the anthocyanes, a subgroup in the large group of polyphenols present in wine." Majno gives bibliographical data in nn. 255-260, p. 498. On honey, see ibid., p. 117: "Honey is antibacterial for several reasons. The most obvious is a simple concentration effect: being extremely hypertonic, it draws water from the bacterial cells, causing them to shrivel and die." References are in nn. 184-197, p. 484.

69. Cf. Celsus, V, 18.5, and Galen, XIII, 341 (recipe with opopanax). See Scarborough, "Asclepiades," p. 53.

Theophrastus says that this particular kind of *panakes* tastes bitter and smells like frankincense. It has two uses, plus an unusual third: first, one can drink it with wine to soothe stomach pains; second, mixed with honey, it helps heal dry wounds, and wet ones are helped by the substance alone. The third use not only is unusual, but proves also that *Historia Plantarum* IX stands solidly within Aristotelianism. Heracles's *panakes* is also beneficial for epilepsy, but it must be mixed "with the curd of a seal (*phōkēs pitua*)," in the proportion of one to four. *Pitua* = *tamisos*,[70] which means that Theophrastus is recommending the rennet from a seal for epilepsy. There are parallels in other authors: Nicander, *Theriaca*, 577, recommends the curd (*tamisos*) of a rabbit or stag as part of an antidote for snakebite, and Nicander, *Alexipharmaca*, 68, uses *puetia* instead of *tamisos*; Dioscorides, II, 75, recommends *pitua* of a rabbit, along with the curd of horses, deer, and other animals – the best being that of a seal – for epilepsy. Not much of this would make much sense, were it not for the scholiast's remarks on *Theriaca*, 577.[71] High-quality cheese was made with curds of various animals (used as a coagulant), and cheese fanciers could tell exactly what animal by the odor. Slightly useful against snake venom (the calcium),[72] *tamisos/pitua* would have small benefit for victims of the "sacred disease."[73]

The choice of a seal by Theophrastus is significant. It is the only animal he mentions in *Historia Plantarum* IX, and the seal was a particularly puzzling animal to Aristotle before him: Aristotle had dissected seals and bats to see why they were "merely quadrupeds badly formed."[74] He had determined that seal kidneys resembled those of an ox, that seals had no gall bladder,[75] did not breathe sea water, bore their young

70. Erotian, *s.v.* *τάμισος*.

71. *Scholia on Theriaca*, 577 (ed. A. Crugnola [Milan: Instituto Editoriale Cisalpino, 1971], p. 220). Also *Scholia on Theocritus*, VII, 16 (ed. F. Dübner [Paris: Didot, 1870(?)], p. 52): *τάμισος δὲ ἡ πυτία εἴρηται παρὰ τὸ θαμίζειν, ὅ ἐσπ πυκνοῦν τὸ γάλα περὶ αὐτὸ στρεφόμενον. ἢ παρὰ τὸ ταμείων αξιοῦσθαι δία τὴν χῆσιν.*

72. G. L. McGrew and B. D. Johnson, "*In Vivo* Effects of Selected *Crotalus* Venoms on Serum Magnesium and Calcium," in A. de Vries and E. Kochva, eds., *Toxins of Animal and Plant Origin* (New York: Gordon and Breach, 1973), III, 1039-1054. E. R. Trethewie, "The Pharmacology and Toxicology of the Venoms of Snakes of Australia and Oceania," in W. Bücherl et. al., eds., *Venomous Animals and Their Venoms* (New York: Academic Press, 1971), II, 79-101, esp. 88. Scarborough, "Nicander's Toxicology," n. 135.

73. Owsei Temkin, *The Falling Sickness*, 2nd ed. (Baltimore: Johns Hopkins Press, 1971), pp. 22, 79.

74. Aristotle, *Progression of Animals*, XIX, 10 (714b10).

75. Aristotle, *Parts of Animals*, III, 9 (671b4-6), IV, 2 (676b28-30).

alive, produced a chorion, had bones like cartilage,[76] and had no external ears.[77] Last, Aristotle said that seals vomited up their curds when they were caught, and the *pitua* was medically useful for epileptics.[78] Theophrastus picked the seal as that animal which would give beneficial curd, most probably because Aristotle, his mentor, attached such importance to it in his study of animals. Likewise, this choice appears in Dioscorides, a fact which may be another instance of the long-range impact of Diocles.[79] At the very least, *Historia Plantarum* IX, 11.3, indicates the heritage of Aristotle, easily seen in *Progression of Animals, Parts of Animals*, and other works. The species is the monk seal (*Monachus monachus* Herm.), the same species that appears in *Odyssey*, IV, 404 and 451. Now a rarity, the monk seal was quite common during classical antiquity in the Mediterranean and Black Seas; it presently occurs only around Rhodes, Corsica, and Cape Caliacra (on the coast of Bulgaria).[80]

Returning to ordinary herbs, Theophrastus quickly lists *kyklaminos* (*Historia Plantarum*, IX, 9.3), *sikuos ho agrios* (IX, 9.4), and *chamaidrys* (IX, 9.5). *Kyklaminos* is the cyclamen, or "sow bread" (*Cyclamen europaeum* L.), from which is extracted cyclamin (triacetyloleandromycin), employed in modern medicine as an antibacterial, emetic, purgative, and hemolytic agent. Generally, cyclamen is a low, primulaceous herb in the *Cyclamen* spp. with tuberous rootstocks and nodding white, purple, pink, or red flowers with reflexed petals. Having written (VII, 9.4) that the root has bark, Theophrastus says (IX, 9.3) that the root is beneficial for running wounds, and mixed with honey is a good wound dressing.[81] Indeed, with the mild antibiotic character of honey added to the cyclamen, this dressing would be quite beneficial. Also the root

76. Aristotle, *Historia Animalium*, VI, 11 (566b27-567a15).

77. Aristotle, *Generation of Animals*, V, 2.24-29 (781b24-29); same as *Parts of Animals*, II, 12.21-24 (657a21-24).

78. Pseudo-Aristotle, *Marvelous Things Heard*, 77 (835b32-34).

79. Dioscorides, II, 75; see notes 9 and 17, above.

80. Two other species of the monk seal–rare–occur in the West Indies (*M. tropicalis*) and Hawaii (*M. schauinslandi*). Otto Keller, *Die antike Tierwelt*, 2 vols. (Leipzig, 1909; reprinted Hildesheim, 1963), I, 407-408, collects a few references. See also B. Mursalogu, "Occurrence of the Monk Seal on the Turkish Coasts," *J. Mammology, 45* (1964), 316-317; A. van Wijngaarden, "The Mediterranean Monk Seal," *Oryx, 6* (1962), 270-273; Judith E. King, "The Monk Seals (Genus *Monachus*)," *Bull. Brit. Mus.* (Nat. Hist.) *Zool., 5* (1956), 201-256. There is a summary in Noel Simon and Paul Geroudet, *Last Survivors* (New York: World Publishing Co., 1970), pp. 258-262.

81. See note 68, above.

can be used as a pessary for women, a reference that forms part of a suppository recipe in Soranus, *Gynecology*, III, 6.32 (Ilberg). The root is good as a charm to promote rapid childbirth; the charm is in little balls, made from the ashes of the root steeped in wine.[82] The juice of the cyclamen is good for "head purges" poured in (the nostrils?) mixed with honey.[83]

Sikuos ho agrios is labeled "squirting" or "wild" cucumber (*Ecballium elaterium* L.),[84] and Theophrastus says that the root is used to treat white leprosy and mange in sheep; the juice extracted was called *elatērion* ("the driver").[85] Related species, like the colocynth (*Citrullus colocynthis* Schrad.) contain albuminoids, pectin, and colocynthin, formerly used as a drastic purgative, and as a purgative for dogs and pigs in veterinary medicine. The Greek *elatērion* states what the extract can do to the bowels.

Chamaidrys is germander (or English treacle, or wood garlic: *Teucrium scordium* L.), which Theophrastus says is used for wounds, fractures, and wounds that seem to be spreading (the leaves, pounded up in olive oil); the fruit functions as a bile purge, and is beneficial for treating ulcers of the eye.[86] The fresh herb has a garlicky odor and a sharp, bitter taste. It contains tannin, as well as scordein and an oil. Formerly employed as a sudorific, scordein (scordium) was once believed to be an antidote for poisons, a tradition that appears in Pliny[87] and Dioscorides.[88]

Two kinds of *strychnoi* follow the *panakē*. One type induces sleep (*hypnōdēs*), while the second variety is called *manikos*. For the sleep

82. Cf. Pliny, *Natural History*, XXIII, 63, with *HP*, IX, 9.4.

83. Cf. Dioscorides, II, 164, and Pliny, *Natural History*, XXV, 133, and XXVI, 149.

84. By Hort, *Theophrastus*, II, 476, and Gow and Scholfield, *Nicander*, p. 235. Cf. Dioscorides, IV, 150, and Pliny, *Natural History*, XX, 3.

85. See also *HP*, IX, 14.1 and 2.

86. *HP*, IX, 9.5. Cf. *HP*, VII, 6.2, and Dioscorides, III, 98.

87. Pliny, XXIV, 130-131 (*Chamaedys herba*), XXV, 63, 100, and 127 (*scordion* = *scordotis*).

88. Dioscorides, III, 97, and 98. Pliny (note 87, above) may reflect the confusion of names in his Greek sources. In *HP*, IX, 9.5, and Dioscorides, III, 98, one meets χαμαίδρυς; in Dioscorides, III, 97, χαμαίδρυς = τεύκριον, and in Dioscorides, III, 111, χαμαίδρυς = σκόρδιον. The confusion is also mirrored in Bernhard Langkavel, *Botanik der spaeteren Griechen* (Berlin, 1866; reprinted Amsterdam: Hakkert, 1964), p. 59. Modern nomenclature makes the "wall germander" and the "water germander" into one species, going back, so it seems, to Theophrastus, who has only χαμαίδρυς. Theophrastus's σκόροδον (σκόρδον) is always garlic.

inducer, one soaks the root in wine, after the bark of the root has been bruised, and then drinks the wine thus treated to bring on drowsiness. The plant here in IX, 11.5, also appears in VII, 15.4, and is the famous deadly nightshade (*Atropa belladonna* L.),[89] or the belladonna leaf. Quite familiar to modern pharmacologists, the extract contains atropine, hyoscyamine, scopolamine, asparagine, choline, chrysatropic acid, atroscine, leucatropic acid, and phytosterol. Modern physicians will sometimes use belladonna as an anticholinergic, and veterinarians employ it to suppress the symptoms of heaves; its former broad veterinary use as an antispasmodic in colic, tetanus, cough, bronchitis, and dyspnea has been supplanted by more uniformly acting drugs. Theophrastus's (and Nicander's) "sleep inducer" would indeed promote relaxation, if the dose were as diluted as *Historia Plantarum* IX, 11.5, suggests. Unfortunately, there are numerous side effects – some quite serious – if the dose is anything other than minute. Such effects would be quite similar to those observed with atropine sulfate, which include xerostomia, brachycardia, mydiasis, blurred vision, and urinary retention.[90]

Stryknos manikos causes insanity (IX, 11.6). This is the thorn apple (*Datura stramonium* L.), again quite familiar in modern pharmacology.[91] The leaves contain 0.25-0.45 percent alkaloids (atropine, hyoscyamine, and scopalamine), plus some proteins and albumin; the seeds have the same constituents, but in lesser quantity. In modern medicine, the extract is called stramonium, and is used as an anticholinergic and antiasthmatic agent, as well as in the treatment of Parkinson's disease. Since 1967, however, the drug of choice has been levodopa. Theophrastus's *manikos* has four basic uses: one drachma improves one's mood; two drachmae cause temporary insanity and delusions; three drachmae cause permanent insanity (here mixed with *opon kentauriou* [*Centaurea salonitana* L. ?]); and four drachmae kill a man.[92] In many

89. Nicander, *Theriaca*, 74 and 878: simply *στρύχνον*, which is probably *στρύχνον ὑπνωτικόν*.

90. Dioscorides, IV, 72.1-2: *στρύχνον ὑπνωτικόν*. In IV, 72.2, one reads *ταύτης ὁ φλοιὸς τῆς ῥίζης οἴνῳ ποθεὶς δραχμῆς μιᾶς ὁλκὴ ὑπνωτικήν*. Dioscorides notes that the effect (*δύναμιν*) of the juice is less than that of the poppy (*τῆς μήκωνος*). Galen, XII, 145-146 (*περὶ τρύχνου ἢ στρύχνου*), also picks up the traditional description, except that the account seems a conflation of *HP*, IX, 11.5 and 6; Galen's *στρύχνον* includes both *στρύχνον ὑπνωτικόν* and *στρύχνον μανικόν*, given separate entries by Theophrastus and Dioscorides.

91. A. F. Blakeslee's *The Genus "Datura"* (New York: Ronald Press, 1959) is a standard reference.

92. The *drachmē* = 52.8 grains = 3.41 grams; the *oxybaphon* = 1/8 pint = 0.06 liters. Scarborough, "Nicander's Toxicology," pp. 6 and 11 with nn. 56 and 115a.

respects, IX, 11.6, is a forecast of the "herbals affecting the mind" found in IX, 18.3-11, followed by reemphasis on the fact that *manikos* causes madness in IX, 19.1. Dioscorides, IV, 73.2, has roughly the same measures for the effects of *manikos*: one drachma gives pleasant visions (or fantasies); two drachmae make one "out of his head" for three days;[93] and four drachmae kill. Dioscorides, unlike Theophrastus, includes an antidote (*antipharmakon*), which is *melikraton*, the honey-water drink seen in *Historia Plantarum*, IX, 11.2.[94]

Three types of spurge (*tithymalloi*) are in *Historia Plantarum*, IX, 11.7-9. These are from the numerous species in the genus *Euphorbia*, which have milky juice and flowers with no petals or sepals. *E. hirta* L. and *E. pilulifera* L. are both very common in India, and possibly some information on these two species came to Theophrastus as a result of Alexander's campaigns there. *E. peplus* L. and *E. paralias* L. are two other candidates for the list. Dioscorides, IV, 164.1-9, has seven varieties. Hort and his sources offer the following nomenclature: *tithymallos* (IX, 11.7) = *E. peplus; tithymallos ho arrēn* (IX, 11.8) = *E. Sibthorpii* (Wimmer offers *E. Characias* [p. 546]); *tithymallos ho myrtitēs* (IX, 11.9) = *E. Mysinites* (same as Wimmer, p. 546). Comparative readings from Dioscorides, IV, 164, and Pliny, *Natural History*, XXVI, 62-66, lead to similar, imprecise conclusions. Whatever the exact species, all the *Euphorbia* contain several resins and an unstable glucoside, widely used in medicine until quite recently in the treatment of asthma and bronchitis. Theophrastus's account says that the dried fruit is given in an unspecified drink (presumably wine), the juice from the whole plant functions as a bowel purge, and the fruit is called a "nut" (*kaletai kauron*).[95] There are two methods of administration: dry the *kauron*, clean it, wash it in water again, then give it to drink mixed with two parts of "black poppy," which all together equal one *oxybaphos*.[96] This concoction is particularly good as a "phlegm-purger from the bowels." The second method involves grinding up the *kauron* in sweet wine, or giving the nut with dried sesame (*Sesamum indicum* L.) to be chewed

93. *δύο δὲ δραχμαὶ ποθεῖσαι ἐξιστάνουσιν ἄρχι τριῶν ἡμερῶν.* In IV, 73.1, Dioscorides gives the other names for *μανικός*: *πέρσειον*, *περισσόν*, *ἄνυδρον*, *πεντόδρυον*, *θρύον*, and *ὀρθόγυιον* (*ἐκαλεσαν*). In Pliny, XXI, 177-179, the name seems to be derived from *ἐρυθρόν*.

94. This is probably the honey-water drink, as in Oribasius (quoting Antyllus), V, 29.7, and V, 14.1 (quoting Galen), contrasted with the honey-milk drink, offered in libation to the powers of the underworld (*Odyssey*, X, 519).

95. Cf. *De Causis Plantarum*, IV, 6.9.

96. See note 92, above.

up. No result is specified, but probably the bowels are purged again.

In IX, 11.10 and 11, occur two varieties of *libanōtis* (with fruit: *Karpimos*; and lacking fruit: *akarpos*). These two types are related to the well-known rosemary (*Rosmarinus officinalis* L.), long employed in the manufacture of perfumes, Eau de Cologne, and toilet soap.[97] By comparing IX, 11.10, with Dioscorides, III, 74.1, and Galen, XII, 60 (and the odd *libanōtis kachryphoros* of Nicander, *Theriaca*, 850), one is reasonably assured that Theophrastus's *libanōtis karpimos* is the rosemary frankincense, *Lecokia cretica* L.; *Libanōtis hē akarpos* is probably the sterile rosemary, *R. sterile*, or *Lactuca graeca*, as in Dioscorides, III, 74.4. According to Theophrastus, the root of the *karpimos* is beneficial for wounds and for "women's matters,"[98] given in dry black wine, and for difficulty in urination (strangury), for ophthalmia and conjunctivitis,[99] and to promote milk in women. *Akarpos* (IX, 11.11) has a root that purges "both ways: up and down," with the upper part of the root for vomiting, the lower part for the bowels. Also *akarpos* functioned as the ancient equivalent of paradichlorobenzene crystals: it kept moths from eating one's clothes. *R. officinalis* contains about 1 percent oil, resin, and the bitter principle (flowers), and oil and tannin (leaves). The leaves were used in medical practice as an emmenagogue, and the tannin would have beneficial effect, especially on open wounds.

Two kinds of *chamaileōn* follow (*cf.* VI, 4.3). *Chamaileōn ho leukos* (IX, 12.1) is the white pine thistle (*Atractylis gummifera* L.). Theophrastus says that the root is to be cooked, chopped up, and eaten like radishes for treatment of diarrhea. For treatment of flatworms,[100] the

97. A good, short summary is in Albert F. Hill, *Economic Botany* (New York: McGraw-Hill, 1952), pp. 185-186.

98. *καὶ πρὸς τὰ γυναικεῖα.* Soranus (ed. Ilberg), II, 24.51, suggests ὁ λιβανωτός (the real frankincense) in the treatment *περὶ ἄφθης* (thrush).

99. *πρὸς τὰς στραγγουρίας καὶ πρὸς τὰ ὦτα καὶ ἄργεμα καὶ πρὸς ὀφαλμίας.* "For the ears" may be similar to the following "for the eyes." *ἄργεμα* are rather curious. Pollux, *Onomasticon* (ed. E. Bethe [Stuttgart: Teubner, 1966; reprint of 1900-1937 ed.]), II, 65: *ἄργεμος[ον]* = *λεύκωμα.* In Dioscorides, III, 84, and Galen, XIV, 775, and Aetius, VII, 39, this means a "spot" in the eye, a thickening of the cornea, an anterior synechia causing a dense white cicatrix of the cornea. Unless Theophrastus or his source is prescribing a kind of pleasant-smelling eye wash (or salve) made from the rosemary frankincense, the text makes little sense.

100. This may be an echo of Aristotle's observations in *Historia Animalium*, V, 19 esp. 551a8-14 and 551b27-30. The flatworm probably is one of the cyclophyllidean tapeworms, common as parasites in man.

victim was to eat some raisins first, then to drink an *oxybaphon*[101] of the scraped root in wine. *Leukos* is fatal to dogs: one mixes it in a meal paste with oil and water to kill them. Likewise, *Leukos* is used to kill pigs: one mixes it with a spurge, *rhaphanos he oreia* (probably *Euphorbia Apios* L.).[102] *Leukos* is useful in sweet wine for unspecified complaints of women.[103] Last, a little folk tradition peeps through in the account of *leukos*: if a sick man is washed with *leukos* (in wine) for three days – and lives – he will recover.[104]

Atractylis gummifera L. yields, by hydrolysis, the poisonous glucoside atractylic acid, in the form of its potassium salt. A highly toxic substance, atractylic acid (or atractyligenin) produces convulsions of a hypoglycemic nature, like strychnine. Atractylic acid would be quite poisonous, but could function as a circulatory stimulant in the manner of a bitter tonic. The plant might be effective against tapeworms, but the side effects would not warrent its use in heavy doses. It appears that the folk traditions have a clearer notion of *A. gummifera.*[105]

Chamaileōn ho melas is *Cardopatium corymbosum* L., the dark pine thistle. Theophrastus (*Historia Plantarum*, IX, 12.2) says that this is beneficial against leprosy, if mixed with vinegar; likewise, a plaster can be made, also useful against leprosy. *Melas* is also fatal to dogs – or ticks on a dog.[106] Dioscorides, III, 9.2, more or less repeats the notion that vinegar and *melas* cure leprosy, and adds that "passed through a hollow quill, [they] will break up a bad tooth." The substance may have had some use as a mild analgesic for toothache, but it is ineffective against leprosy. Until recently, the ethyl asters of some acids in chaulmoogra oil (from the Burmese tree, *Hydnocarpus Kurzii* [the seeds within the velvety fruit]) provided an effective, if painful, chemotherapy for leprosy. Modern drugs of choice are among the sulfones, especially dapsone (4,4'-sulfonyldianiline).

Three kinds of *mēkōnes* constitute the listings in *Historia Plantarum*, IX, 12.3-5. All appear to be wild poppies, none of which is the famous

101. See note 92, above.

102. Cf. Dioscorides, IV, 175 (which Wellmann [ed., *Materia Medica*, II, 324] asserts comes from Diocles, owing to the similarity to Theophrastus, *HP*, IX, 9.6).

103. Pliny, XXII, 21.45-47, picks up this tradition among others; XXII, 45: "Hac mastiche utuntur mulieres." There is no trace in Soranus.

104. One is reminded of Cato, *On Agriculture*, 157.10 (where Cato is extolling the medical virtues of cabbage): "Item pueros pusillos si laves eo lotio, numquam debiles fient." Scarborough, *Roman Medicine*, pp. 17-21 (on Cato).

105. Cf. Nicander, *Theriaca*, 656, and Dawkins, "Greek Names for Plants," p. 5.

106. Hort, Theophrastus, II, 279, n. 7: κύνας may be κυνορραΐστας, dog-ticks, as conjectured by Reinesius from Pliny's *ricinos canum.*

opium poppy (*Papaver somniferum* L., or *P. album* Mill.). *Mēkōn hē keratitis* (IX, 12.3) is the horned poppy (*Glaucium flavum* L. [Hort gives var. Serpierii]), the fruit of which "has the power to clean out the bowels," and the leaf removes *argema* from sheep.[107] *Mēkōn hē rhoias* (IX, 12.4) is called the corn poppy in North America (*Papaver rhoeas* L.; Hort offers *P. hybridum*), and is a bowel purge. *Mēkōn hē Hrakleia*, "frothy poppy" (IX, 12.5; *Silene venosa*, so Hort thinks), cleans as an emetic, and is employed in mead as a treatment for epileptics.[108]

There is a curious absence in this section: the opium poppy, which appears only once in the entire *Historia Plantarum*, and that reference is a very brief notice in I, 12.2, in a section on saps. The fig and the poppy have milky saps. And that is all. Even this one citation may be in doubt, because the Greek text is quite corrupted.[109] Given the fame and widespread employment of *Papaver somniferum* L. in classical antiquity (references begin with Homer, *Iliad*, VIII, 306), there may be good reason why Theophrastus declined to include it in his herbs and herbals. Almost all other sources in Greek and Roman pharmacy and medicine include the opium poppy, and the list is impressive: Nicander,[110] Theocritus,[111] Dioscorides,[112]

107. See note 99, above.

108. Cf. Dioscorides, IV, 64, and Pliny, XX, 205-206; Dioscorides, IV, 64, and Pliny, XIX, 167-169; and Dioscorides, IV, 66, and Pliny, XX, 207.

109. Hort, *Theophrastus*, I, 86, n. 4.

110. *Theriaca*, 946; *Alexipharmaca*, 433-440 (in list of poisons); Athenaeus, XV, 683f-684a (from Nicander, *Geo ·a*; frag. 74 in Gow and Scholfield). Nicander has *P. rhoeas* in *Theriaca*, 851, and *Glaucium flavum* in *Theriaca*, 852.

111. Theocritus, *Idylls*, VII, 157; XI, 57-58. *Scholia on Theocritus: Idylls* (ed. F. Dübner), III, 29: *τηλέφιον δὲ ἐστι τὸ φύλλον τῆς μήκωνος*. A. S. F. Gow, *Theocritus*, 2 vols. (Cambridge: Cambridge University Press, 1952), II, 70, notes that the scholiast seems uncertain, because a second reading appears.

112. Dioscorides, IV, 64.1-7, is an extended account, beginning with the definite distinction of cultivation: *μήκων· ἡ μὲν τίς ἐστιν ἥμερος καὶ κηπευτή*. Dioscorides' authorities have warnings: Erasistratus (quoted by Diagoras) thought the use of the opium poppy was inadvisable for eye or ear problems, because it dulled vision and caused sleep (IV, 64.6); Andreas is quoted (ibid.) as saying that it causes blindness; Mnesidemus (ibid.) thought the opium poppy had two uses: for the odor and as a sleep inducer. The odor and bright color of the opium poppy figure in numerous similes in Greek and Roman poetry, as indicated by the references in Saara Lilja, *The Treatment of Odours in the Poetry of Antiquity* (Helsinki: Societas Scientiarum Fennica [*Commentationes Humanarum Litterarum*, 49], 1972), pp. 193-195. Dioscorides, IV, 64.5, also remarks that there are some "fake" opium products, suggesting (1) great demand for the genuine article and (2) willing customers for the adulterated juice. Earlier (IV, 64.3), he has written *πλείων δὲ ποθεὶς βαπτίζει ⟨ὕπνῳ⟩ ληθαργωδῶς καὶ ἀναιρεῖ*.

Celsus,[113] Pliny,[114] and Galen,[115] among many. Theophrastus's silence, however, may have a simple explanation, because the juice of *P. rhoeas* does have a small amount of opium, and would be a mild narcotic and anodyne. In IX, 16.8, *mēkōn* is coupled with *kōneion*, suggesting a hemlock poppy, another plant altogether. It may be that the "cultivated" poppy was not common in Theophrastus's time, and that he would not have recognized the substance as either more useful or more dangerous than other "saps." Some support for this conclusion lies in the treatment that Celsus gives to the poppy: in *De medicina*, V, 27.12B-C, Celsus does not include the poppy in his list of poisons, which suggests he knew only of a mild variety; he does, however, recommend the juice of *papaver* (probably *P. rhoeas*) as an internal medicine to induce sleep and relieve pain, and he advises its external application to alleviate pains in the parts.[116] Theophrastus's notice of

113. See note 116, below.

114. Pliny has a great number of vague references to *papaver*. The following passages are quite definitely about the opium poppy: XVIII, 229 ("visque somnifera etiam sativo"); XIX, 168-169 (beginning with "papaveris sativi tria genera"); XX, 61-64 (where Pliny has ignored the warnings in Dioscorides, IV, 64.6, "as sanat omnia oculorum vitia cum lacte mulierum, argema" [see note 99, above] nubiculas, cicatrices adustionesque omnes, praecipue caligines" [61]; the listing continues, with the *sucus* curing bowels, snakebites, the stings of spiders and scorpions, etc. Pliny quotes Crateuas [63] as recommending this poppy juice for dropsy); XX, 198-203 (authorities quoted: Diagoras, Iollas, Erasistratus, Andreas; this time, Pliny also quotes the warning of Diagoras and Erasistratus [200] in contradiction to XX, 61); XXI, 70 (probable); XXVI, 44 (probable); XXVI, 74 (probable); XXIX, 43 (doubtful); XXX, 60 (probable). The rest of Pliny's references to *papaver* are either to another kind, or are to the use of the poppy as a comparison. Index listings appear in L. Ian and C. Mayhoff, eds., *C. Plinius Secundus: Naturalis Historia*, 6 vols. (Leipzig: Teubner, 1865-1898; reprinted 1970), VI, 289-290, and vol. VII of the Loeb *Pliny: Natural History*, ed. and trans. W. H. S. Jones (Cambridge, Mass.: Harvard University Press, 1956), p. 527.

115. Galen, VI, 548 (= G. Helmreich, ed., *Galeni De Alimentorum Facultatibus*, 31 [*Corpus Medicorum Graecorum*, V, 4, 2 (1923)], p. 258); XII, 72-74; XIII, 37-47 (some collected recipes and authorities). There is enough evidence to suggest that Galen may have encouraged Marcus Aurelius in the use of the drug for its well-known effects; → Thomas W. Africa, "The Opium Addiction of Marcus Aurelius," *J. Hist. Ideas, 22* (1961), 97-102. But maybe mandrake was involved; → E. C. Witke, "Marcus Aurelius and Mandragora," *Class. Phil., 60* (1965), 23-24.

116. Celsus, II, 32 (sleep); V, 23B (part of an antidote), 25.4 (*silvestris papaveris* in the making of *catapotia*, used for sleeping pills, etc.); III, 10.2 (bread soaked *papavere* applied to the head for headache); 18.2 (a drink of *papaver* mixture for sleep); IV, 17.1 (*album papaver* added to the diet for treating kidney disease); 27.1E (from a fragmented text on *coeuntia*, including *nigrum papaver*); 31.6-7 (*papaveris cortices* and *sucus papaveris* in a remedy for joint pains).

Silene venosa in the treatment of epilepsy would refer to the "mild" variety, and the reference in *Historia Plantarum*, IX, 12.5, has parallels in Dioscorides (IV, 66) and Pliny (XIX, 21, and XX, 207).

In *Historia Plantarum*, IX, 13, there appear six plants in rapid order: *nymphaia* (13.1), *hē Skythikē* (13.2), *hē aristolochia* (13.3 = [more or less] IX, 20.4), *to ereuthedanon* (13.6), *skorpios* (13.6), and *polypodion* (13.6). Book IX, 13.4-5, gives a short digression on the color and taste of some plants, suggesting the classification observed in *Causis Plantarum*, VI, 4.5. *Nymphaia* is most probably a yellow water lily (*Nuphar luteum* [L.] Sibth. & Sm.), from which is extracted nupharidine. Theophrastus says that it functions as a wound-clotter (*ischaimon*) and is useful in a drink (wine? water?) for *dysenteria. Hē Skythikē* is the "Scythian root" or licorice (*Glycyrrhiza glabra* L.), still useful as a demulcent and expectorant. In Theophrastus, the plant is employed for asthma, dry cough, and as a thirst quencher (he says that with mare's cheese, the Scythians use this root to go without water for twelve or thirteen days); and mixed with honey, the root is good for wounds.[117] *Aristolochia* is a birthwort (probably *Aristolochia rotunda* L.), which Theophrastus recommends for wounds of the head, other wounds, and for what appears to be snakebite.[118] The substance is a sleep inducer, and is useful "for the womb" (*pros hysteran*). There are three methods of preparation and use: as a plaster, steeped in water, and given shredded in honey or olive oil. From the *Aristolochia* spp. comes aristolochic acid, which is employed as an aromatic bitter, and which produces toxic effects in laboratory animals (cardiac and respiratory arrest). *To ereuthedanon* is madder (*Rubia tinctorium* L.), which Theophrastus says is used as a diuretic and for pains in the loins.[119] Extracted from *R. tinctorium* are ruberythric acid and rubiadin. *Skorpios* is a plant sometimes called leopard's bane, one of the composite herbs in the genus *Doronicum*, usually having alternate, clasping leaves and yellow flowers (another plant called leopard's bane is *Arnica montana* L., from northern Europe, which yields tannin, resin, arnicin, arnidiol, and anthoxantine, used as a topical counterirritant). The plant described in Book IX, 13.6, has what appears to be the well-known notion of "signatures," because the root looks like a scorpion. It will, therefore, be effective against scorpion stings. The root would have some small

117. Cf. Scribonius Largus, *Conpositiones* (ed. G. Helmreich [Leipzig: Teubner, 1887]), LXXV. Scarborough, "Asclepiades," pp. 48-49. Dioscorides, III, 5.

118. Cf. Nicander, *Theriaca*, 509-519; Pliny, XXV, 95; Dioscorides, IV, 4.

119. Cf. Pliny, XIX, 47, and Dioscorides, III, 143.

benefit as a counterirritant against scorpion stings,[120] and Theophrastus and his sources have recorded a useful remedy.[121] Ending this section is the curious notice of *polypodion*, which is a fern in the genus *Polypodium* (probably *P. vulgare* L.) with creeping rootstalks, deeply pinnatifid evergreen fronds, and round, bare sori. Again the "doctrine" of signatures appears: not only is *polypodion* useful as a bowel purge, it is a potent charm against *polypoun* ("polyp") because the root looks like an octopus (*polypous*).[122]

After an important description of what drugs will keep – and what that will not[123] – as well as further definition by way of geographical and topographical location,[124] one comes to a short section on the *pharmakōdeis* native to the island of Crete (IX, 16.1-3). Here are *to diktamnon* (16.1), *to pseudodiktamnon* (16.2), and *Heteron diktamnon* (16.3). All three are dittanies, labiate plants. *Diktamnon* is probably the Cretan dittany (*Origanum Dictamnus* L.), said by Theophrastus to be used in difficult childbirth,[125] given in water. *Pseudodiktamnon* and

120. Experimental evidence shows that thiamine deficiency elevates the toxic action of scorpion venom. See Max W. McIntosh and Dean D. Watt, "Molecular Aspects of Neurotoxic Principle in Venom of the Scorpion *Centruroides sculpturatus*," in Findlay E. Russell and Paul R. Saunders, eds., *Animal Toxins* (Oxford: Pergamon Press, 1967), pp. 41-46 (esp. pp. 43, 45-46), and "Biochemical-Immunochemical Aspects of the Venom from the Scorpion *Centruroides sculpturatus*," ibid., pp. 47-58.

121. Cf. Dioscorides, II, 11-12, 33, and 78; IV, 51.

122. Cf. Dioscorides, II, 35 (ζῷα); II, 49; IV, 186.

123. *HP*, IX, 14.1-4. Some examples: ὁ μὲν γὰρ ἐλλέβορος καὶ τριάκοντα ἔτη χρήσιμος, ἡ δὲ ἀριστολοχία πέντε ἢ ἕξ, χαμαιλέων δὲ ὁ μέλας τετταράκοντα, κενταυρὶς δὲ δέκα ἢ δώδεκα (14.1). A pest of these stored roots is σφονδύλη (14.3), some kind of beetle. Section 14.4 is omitted in the MS called I Einarson, "The Manuscripts of Theophrastus's *Historia Plantarum*," *Class. Phil.*, *71* (1976), 68-70, and Hort, *Theophrastus*, II, 288, n. 4.

124. *HP*, IX, 15.1-8. E.g., φαρμακώδεις ... δοκοῦσιν εἶναι τόποι μάλιστα τῶν μὲν ἔξω τῆς Ἑλλάδος: Etruria, Latium, and Egypt (15.1); Ethiopia, Scythia, India (15.2 [this last looks like pure legend]); Thrace (15. 3). τῶν δὲ περὶ τὴν Ἑλλάδα τόπων φαρμακωδέστατον: Pelion in Thessaly, Telethrion in Euboea, Arcadia, and Laconia (15.4). Arcadia has cows (and thus the Arcadians drink cows' milk), two kinds of hellebore, carrot (?), a saffron-bay, spurge, marsh mallow, birthwort, hartwort, two kinds of στρύχνος (15.1), the "squirting" cucumber (making ἐλατήριον), and τιθύμαλλος (15.6), and πανάκεια. Most of these plants are in Laconia, too. Achaea has tragacanth (15.8).

125. Soranus (ed. (Ilberg), III, 38.5 (δίκταμνον is part of hot concoctions for the treatment of μύλη [lit. "millstone"] of the uterus); IV, 13(65).2 (rejection of δίκταμνον, among other herbals, recommended by Hippocrates [*Women's Diseases*, I, 77 (ed. Littré. VIII, 170-172)] for rapid childbirth); IV, 14(I 71).2 (Euryphon of Cnidos makes a diuretic to pull out afterbirth [χόριον] from

heteron diktamnon are, as Theophrastus says, much the same as *diktamnon*, except that *pseudodiktamnon* and *heteron* are weaker. *Pseudodiktamnon* appears, however,[126] to be *Dictamnus albus* L., sometimes called fraxinella or gas plant, because it emits a "burning" vapor. *D. albus* is a perennial, rutaceous plant, yielding dictamine (4-methoxyfuro [2, 3-b] quinoline). Even more confused is the account of *heteron*, and Theophrastus's notice does not allow definite identification (Hort offers *Ballota acetabulosa* for *pseudodiktamnon*, and *B. Pseudodictamnus* for *heteron diktamnon*).[127]

To akoniton is Theophrastus's beginning subject in his consideration of harmful plants, and the passages on *akoniton* appear jumbled and occasionally corrupt (IX, 16.5-6). The confusion of the Greek text is illustrated in the development and almost immediate contradiction in the account: *akoniton* can be mixed to give death calculated in advance (two, three, six months, one or two years); it causes a very painful, lingering death, with the body wasting away, and there is no known *lutikon pharmakon* ("counteracting medicinal").[128] The next sentence in 16.5 is contradictory: "Countryfolk occasionally can save someone with honey and wine and similar things."[129] It appears that the two types of traditions – folk and learned – have been set side by side for comparison. Then follow some extremely corrupted passages (16.6) that seem to be about *ephēmeron* (rendered by Hort as "meadow-

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δίκταμνον καὶ ἐλελίσφακος; rejected in IV, 15 [I 72] with *πάντα δὲ μοχθηρὰ τὰ προειρημένα. δίκταμνον* appears in a gynecological context in the Hippocratic *corpus*, as prescribed by Euryphon, in *Women's Diseases*, I, 78 (ed. Littré, VIII, 176-179), and in *Nature of Women*, 32 (ed. Littré, VII, 346-350).

126. *HP*, IX, 16.2: *διαθερμαίνει γὰρ ἀπὸ μικροῦ σφόδρα. τιθέασι δὲ τὰς δεσμίδας ἐν νάρθηκι ἢ καλάμῳ πρὸς τὸ μὴ ἀποπνεῖν.* See Ronald Good, *The Geography of the Flowering Plants*, 3rd ed. (London: Longman, 1971), pp. 192 and 344.

127. See Hort, *Theophrastus*, II, 484 and 445.

128. *HP*, IX, 16.5: *λυτικὸν δὲ φάρμακον οὐχ εὑρῆσθαι, καθάπερ ἀκούομεν ἑτέρων τι φύεσθαι.* Wimmer, ed., p. 157, conjectures *ἕτερον τι φυόμενον* for the end of the sentence. Hort, *Theophrastus*, II, 300. accepts Schneider's conjecture *ἑτέρων*, together with an emended reading from the Codex Urbinas (U), and the early printed editions (Editio Aldina, Venice, 1495-1498 [Ald.] and Editio Heinsii [Heinsius], Leiden, 1613 [H]). See the fuller account in Einarson, "Manuscripts of Theophrastus's *Historia Plantarum*," pp. 67-76.

129. *HP*, IX, 16.5: *ἀλλὲ τοὺς ἐγχωρίους ἀνασώζειν τινὰς μέλιτι καὶ οἴνῳ.* Hort, *Theophrastus*, II, p. 300, attempts reasonable readings from U and the Codex Medici (M: two, but in very close agreement), while a gloss *εὕρηνται* appears in Ald. and H. Hort's text is the same as Wimmer's p. 157.

saffron") and countermeasures.[130] In 16.7 (after a confused passage about *ephēmeron* being taken by slaves to fake death to outwit masters, then fooling themselves by dying), the text returns to *akoniton*, "which is useless to those who do not understand it." In fact, "one is not supposed to possess it, under the penalty of death."[131] And – seemingly in the carefree manner of a folk tradition – this presumed "legal" statement is followed with the notion that the time that *akoniton* takes to kill is equal to the time since it was gathered.

Even with the confusion in the Greek text of IX, 16.4-7, one perceives a murky theory of toxic action, especially in the choice of *lutikon* to describe what moderns would call an "antidote." As an adjective in the ordinary Greek of Theophrastus's time, *lutikon* is "able to loosen,"

130. U, M, and Ald. all have different versions, largely irreconcilable. Wimmer's readings (pp. 157-158) are as uncertain as those of Hort (II, 300). Hort (ibid., n. 4) states that the passage "is confused, and the text is probably defective." Hort accepts an emendation proposed by Guilandinus (16.6: ἢ τῷ λειρίῳ; Wimmer: ἢ τῷ αἰρίῳ, from Ald. and H) on the basis of Dioscorides, IV, 84.

131. This may refer to the Athenian officials who administered poison to those condemned to death (e.g., the famous passages in Plato, *Phaedo*, esp. 63d5-e5 and 117b6-9). Κώνειον was the preferred poison, as Theophrastus indicates below (*HP*, IX, 16.9). In Attic law, the *archon basileus* had charge of cases involving poison in homicide (Aristotle, *Athenian Constitution*, 57.2-3), so it may be that he had appointed assistants to aid in carrying out sentences that employed poison. If one extrapolates that no "expert" testimony really mattered in Attic trials (e.g., the "evidence" given by a surgeon, on wounds, in Demosthenes, *Against Conon*, 11-14, is no more weighty than other witnesses; also see Demosthenes, *Against Evergus*, 67, and Lysias, *On the Refusal of a Pension to an Invalid*, 13-14, where *no* medical "evidence" appears; a modern court would demand it), then no "expert" in poisons was involved. Antiphon, *Orations*, I (rendered as "Against a Step-Mother on a Charge of Poisoning" by K. Freeman, *The Murder of Herodes* [New York: Norton, 1963], pp. 86-94), esp. 7, proves that poisons were readily available to citizens in Athens in the late fith and early fourth centuries B.C. General background (procedure, etc.) is given in A. R. W. Harrison, *The Law of Athens*, 2 vols. (Oxford: Clarendon Press, 1968-1971), esp. II, 9 and 134. See a Christopher Gill, "The Death of Socrates," *Class. Quart.*, *67*, n.s. *23* (1973), 25-28. Darrel W. Amundsen and Gary B. Ferngren, "The Physician as an Expert in Athenian Law," *Bull. Hist. Med.*, *51* (1977), 202-213, deftly analyze the basic question of "expert medical testimony." Amundsen and Ferngren note that two problems cause difficulty in the investigation of this question: (1) the lack of detailed evidence and (2) "the predominant tendency of modern scholars to base their conclusions on comparisons of Athenian private procedure with the much more rigidly defined modern usages" (p. 213). The authors, however, make the important point that Athenian law and its private procedure *could* allow such expert testimony "when [it was] deemed desirable by the individual" (ibid.).

which then is extended into the more specific "laxative."[132] In a medical or pharmacological context, it then can mean "able to loosen [that which tightens]," particularly a harmful substance ingested.[133] The account in Nicander (on hemlock) supports this conclusion,[134] and Gill has shown that Plato left the "choking" out of the *Phaedo* for his own illustrative purposes when discussing philosophic points.[135]

To akoniton is wolf's bane (or monk's hood, friar's cowl, or mousebane), *Aconitum napellus* L., one species in the large genus *Aconitum.*[136] A well-known toxic substance, aconite, was employed as a febrifuge and gastric anesthetic in medical and veterinary practice. No longer used in the pharmacopeia of modern medicine, aconite is sometimes used by veterinarians to treat laminitis in horses. The most powerful of the aconites is *Aconitum Ferox* Wall., the Indian aconite (also called bikhroot, bish, visha, and bishma), used until quite recently by Indians as an arrow poison to kill large animals. Given the confused state of the text in IX, 15.2, it is quite possible that Theophrastus had indeed "heard" stories about Indian arrow poison, as they were filtered through travelers' accounts, along with the tales that came from Somalia and Ethiopia.[137]

132. Athenaeus, III, 92c (quoting Mnesithius = frag. 36, in Janine Bertier, *Mnésithée et Dieuchès* [Leiden: Brill, 1972], p. 194), and Pseudo-Aristotle, *Problems*, 949a5.

133. Later theories of toxic action (those of Galen, etc.) did not employ the laxative notion, but modified it to mean a "drawing out" of the poisons, as well as a way of correcting the imbalance in the innate heat caused by the poison. Galen, IV, 584; X, 896; XI, 761 and 823. Scarborough, "Nicander's Toxicology," p. 10 and n. 114. Walter Pagel, "Peripheral Venous Flow 'Ascending' to the Heart (Ficinus 1489) and the Spread of Poison," *Episteme, 6* (1972), 128-134 (esp. 129).

134. Nicander, *Alexipharmaca*, 186-194.

135. Gill, "Death of Socrates," pp. 25-28 (esp. pp. 25 and 28).

136. Good, *Flowering Plants*, p. 85: there are over 200 species in *Aconitum.*

137. *HP*, IX, 15.2, indicates the muddled and questionable nature of Theophrastus's sources with *εἴπερ ἀληθῆ λέγουσιν*. The only arrow poison identified by Hort (*Theophrastus*, II, 290-291, and 485) is the *ῥίζα θανατήφορος*, "Somali arrow-poison, *Acokanthera Schimperi.*" Called Abyssinin or carissin, the glycoside in the root, bark, and seeds of *A. schimperi* (A. DC.) Beth & Hook. is the active principle of carissin, or African arrow poison. The state of the text in *HP*, IX, 15.2, suggests conflation, since Ethiopia and Scythia have the poison, followed by *ἐν Ἰνδοῖς*, where the text becomes extremely corrupt. E.g., *ἥ τε δυναμένη τὸ αἷμα διαχεῖν καὶ οἷον ὑποφεύγειν* makes little sense, unless one assumes a "flight" of arrows, rather than blood. These passages in *HP*, IX, are illustrative of the need for a critical edition. *ἅ δή φασιν εὑρῆσθαι πρὸς τὲ τῶν ὀφιδίων τῶν θανατηφόρων* suggests a filtered story about Indian cobras and the like, compacted with other tales of arrow poisons, antidotes, and drugs. Even after Alexander's expedition, "India" simply meant Ethiopia and the

Thus, in addition to Diocles of Carystos,[138] and the *rhizotomoi-pharmacopōlae,*[139] Theophrastus employed some garbled tales that had trickled in from the "East" to Greece over several centuries. There are, of course, some instances in the *Historia Plantarum* that indicate clear contact and awareness of Alexander's discoveries in Media and India,[140] but even in these passages there is an uncertainty that mitigates against any systematic collecting of data on plant lore from the expedition of Alexander into India.[141]

More important to Theophrastus than odd stories from India, Ethiopia, and points east are the local authorities he cites for some of his account on hemlock. In IX, 16.8, we are told that Thrasyas of Mantinea discovered – so it was said – the painless death from the juices of hemlock (*kōneion*) and poppy (*mēkōnos*) and other such plants. No more information follows on the poppy, so that confusion appears between the two (earlier in IX, 12.3-5, no opium poppy appears), as the Greek *kōneiou . . . mēkōnos* (perhaps rendered "hemlock poppy" or "poppy hemlock") would suggest (IX, 16.8). Thrasyas made small doses of the poison (a drachma or so), which worked very well, and kept indefinitely. Thrasyas's student Alexias was also skilled in these matters. Neither Thrasyas nor Alexias is known from other sources, unless the "Thrasea the surgeon" of Scribonius Largus (208 Helmreich) and Galen (XIII, 741) is the same as Theophrastus's Thrasyas (Galen gives a recipe of Thrasea [*Tharseos* in the Kühn text] called the Indian"). It is probable that Thrasyas and Alexias were either informants (like the Satyrus in *Historia Plantarum*, III, 12.4) or deceased predecessors, given

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Somali coast (Strabo, I, 61, and XV, 86-87) and the *Indica* of Ctesias "showed [that the Greeks] could not tell true stories of distant lands from false ones" (M. Cary and E. H. Warmington, *The Ancient Explorers* [Harmondsworth: Penguin Books, 1963], p. 80). See also Truesdell S. Brown, *The Greek Historians* (Lexington, Mass.: D.C. Heath, 1973), pp. 77-86 (esp. pp. 81-83); Ctesias knew of Scylax, probably through Herodotus. In addition to Brown's notes for the sources on Ctesias, see H. H. Wilson, *Notes on the Indica of Ctesias* (Oxford: Ashmolean Society, 1836), a pioneering work employing Sanskrit and Persian comparisons.

138. See notes 9, 10, and 17, above.

139. See note 17, above.

140. Theophrastus's notices on "India" show a fuzziness, even in the context of Alexander's expedition; see e.g., *HP*, IV, 1 (*εἶναι μυθολογοῦσι* and *λέγεται* [Wimmer] on Indian ivy and Alexander). Hort, *Theophrastus*, I, 310-311, thinks the text is defective. See Wimmer, ed., under Ἰνδοί.

141. The exception may be the description of some flora by the admiral Androsthenes on a voyage from the Indus to the Persian Gulf: *HP*, IV, 7.7, and V, 4.7-8; see *De Causis Plantarum*, II, 5.5 (on the island of Tylos [Bahrein]: teak wood, calamader wood, and peculiar qualities of rain on the island).

Theophrastus's habit of not naming contemporary authorities.[142] The clipped description in *Historia Plantarum*, IX, 16.8-9, on the dosage fairly well agrees with the methods described in Plato's *Phaedo*, 63d5-e5 and 117b6-9, and Thrasyas and Alexias probably lived at least a generation before Theophrastus. Likewise, the description of the better "preparation of *kōneion*" (IX, 16.9) seems enough like the picture (however mauled) in the *Phaedo* to indicate that Theophrastus's information emerged around 400 B.C. He says that previously (*proteron*) the Cheans (Ceos) used *kōneion* like everyone else, simply shredding it up. Somebody from Ceos was the source of this small bit of recent history. Now – Theophrastus continues – the method is much better: one strips off the outer shell, removing the husk because this part is not easily assimilated;[143] then one bruises it in a mortar, runs it through a fine sieve, and finally sprinkles it on water to drink.[144]

Kōneion is the famous hemlock quaffed by Socrates in 399 B.C.[145] The plant is *Conium maculatum* L., and bears various popular names, including poison parsley and spotted cowbane, as well as the usual hemlock. *C. maculatum* yields coniine (conicine; cicutine; 2-propylpiperidine) that causes the classic symptoms: weakness, sleepiness, nausea, vomiting, difficult respiration, paralysis, asphyxia, and death. Two modern derivatives are part of the pharmacopeia: coniine hydrobromide and coniine hydrochloride. Both are occasionally employed as antispasmodics, and both derivatives are highly toxic.

Theophrastus develops further his ideas on toxic action, first mentioned in *Historia Plantarum*, IX, 16.4-7. In IX, 17.1, he returns to hellebore to illustrate how one could build resistance to toxic drugs, as did Thrasyas by eating hellebore. In IX, 17.2, Theophrastus proposes that *asynetheia* ("unfamiliarity") may be the reason that some *pharmaka* give toxic, rather than beneficial, effects. Thrasyas had proved that once the *physis* of man's body had accepted (*prosdexamenēs*) *pharmaka*, the

142. See Benedict Einarson and George K. K. Link, eds., *Theophrastus: De Causis Plantarum* (Cambridge, Mass.: Harvard University Press, 1976), I (bks. I and II), xix-xx: "Other writers on agriculture are occasionally mentioned, but only when (like the philosophers) they were no longer living . . . It was good form not to mention a contemporary by name."

143. *HP*, IX, 16.9. Cf. *De Causis Plantarum*, I, 14.4.

144. Cf. Plato, *Phaedo*, 117a. Hans Gossen, "Schierling," *RE*, suppl. vol. VIII (Stuttgart, 1956), cols. 706-710.

145. Although Plato uses only φάρμακον in the *Phaedo*, the traditional view that Plato's φάρμακον = κώνειον is well argued by John Burnet, ed., *Phaedo* (Oxford: Clarendon Press, 1911), Appendix I, and accepted by R. Hackforth, trans., *Plato's Phaedo* (Cambridge: Cambridge University Press, 1955), p. 194.

physis overcame (*katakratousēs*) them, and they were no longer *pharmaka*. Like Plato before him in the *Phaedo*, Theophrastus generally uses *pharmakon* to mean "drug," while rarely one reads *thanatēphoros* when he means "deadly drug" or "poison" (for example, *Historia Plantarum*, IX, 16.7).[146] Later medical and toxicological authorities employ a more specific vocabulary,[147] but this notion of "overcoming" the poison became quite popular among rulers who feared assassination by poisoning.[148] Mithridates VI of Pontus became quite famous for his antidote concoctions, which he presumed gave him immunity from the insidious assassin armed with poisons.[149]

With the exception of IX, 18.3-11, the remainder of the passages about herbs and herbals in *Historia Plantarum* discusses a curious mixture of plants, ingredients, and folk traditions. Book IX, 18.3-11, is an extended section on substances that "have effect on both the body and the powers of the mind" (18.3).[150] These passages deserve detailed analysis, because they include a number of *pharmaka* that have *dynameis* for both men's and women's sexual problems. Consequently IX, 18.3-11, is a rich source of aphrodisiac lore, beginning with the observation that most of the ingredients that follow act "like squill" (18.3-4).[151] The major authority cited by Theophrastus in these passages is Aristophilus of Plataea (18.4), who seems to have been a drug-vendor a specializing in love potions. Many of the traditions have complex histories, and many of the plants named are puzzling.

Odds and ends remain. *Akantha* appears in IX, 18.1. This is used for fractures, coughs (mixed in sweet wine), and various wounds (mixed in olive oil).[152] *Akantha* is gum arabic, or acacia, the dried gummy exuda-

146. Other references in *HP* for θανατήφορος are: IX, 13.4; 15.2; 16.4. In *De Causis Plantarum*, θαναθήφορος occurs in VI, 4.5 and 5.5.

147. E.g., Nicander, Galen, and Philumenus.

148. E.g., Attalus III of Pergamon. See Galen, XII, 252, and XIII, 416.

149. Galen, XIV, 2 (Mithridates and Attalus), XIII, 23, 52-54, 329-331, XIV, 2-3, 152-154, 283-284; Pliny, XXV, 6-7; Aulus Gellius, *Attic Nights*, XVII, 17. See Gilbert Watson, *Theriac and Mithridatium* (London: Wellcome Historical Medical Library, 1966), pp. 33-44.

150. Without warning, Hort in *Theophrastus* omits both text and translation of *HP*, IX, 18.3-11. The text with a Latin translation is in Wimmer, ed., pp. 159-161.

151. Squill is *Urginea maritima* (L.) Baker. A basic reference is Jerry Stannard, "Squill in Ancient and Medieval Materia Medica, with Special Reference to Its Employment in Dropsy," *Bull. N.Y. Acad. Med.*, *50* (1974), 684-713 (esp. 686-696).

152. Cf. Dioscorides, III, 14.6, and Pliny, XX, 84.

tion from the stems and branches of *Acacia senegal* (L.) Willd. and other species of African acacia.[153] The gum contains tannin. Medically, acacia is used as a demulcent, and once was employed as a colloidal solution (intravenous) for shock and edema. Veterinarians use acacia as a demulcent for mild diarrhea in small animals, foals, and calves. *To thleyphonon* (18.2) is another name for *skorpion* (wolf's bane, in the genus *Aconitum*), useful against scorpion's sting (see IX, 16.5-6, above). *Strychnos ho manikos* (IX, 19.1) is the same as the thorn apple, which caused madness in IX, 11.6, above. Also in IX, 19.1 is the root of the *onothēras* (= *daphnē hē agria*),[154] which when mixed with wine elevates the mood. *Onothēras* is oleander (*Nerium oleander* L.), from which one gains oleandrin (folinerin), used in modern medical practice for cardiac insufficiency; oleandrin is a powerful diuretic. In IX, 19.2, Theophrastus scorns the use of charms and amulets (*alexipharmaka*), which seem to have been quite popular in his time. The term *alexipharmakon* soon took on the specific meaning in Greek of "antidote," best illustrated in Nicander's poem bearing the name.

Heleiochrysos (19.3), *peperi* (20.1), the Cnidian *kokkos, peukedanon, daukon* (20.2), *ampelos hē agria* (= *mēlōthron*), *drakontion, thapsia* (20.3), *to tēs ebenou xylon, aristolochia* (20.4), *skammōnia*, and *pteris* (20.5) are the plants and substances listed in the last section of *Historia Plantarum*. One medicinal appears in *On Odors* by Theophrastus: *to megaleion* (35). *Heleiochrysos* is useful for burns (mixed with honey) and for *ta daketa* ("stings" or "bites" of venomous animals).[155] This is probably the gold flower (*Helichrysum siculum* L.), also recorded in Nicander, *Theriaca*, 625, as a remedy for poisonous bites. It has had little use in the pharmacopeia since the eighteenth century. *Peperi* is used, says Theophrastus, as an "aid" against hemlock, like frankincense (*ho libanōtos*: in the *Boswellia* spp., yielding olibanum as a gum resin).[156] *Peperi* is pepper (*Piper nigrum* L.), which gives piperine (1-piperoylpiperidine), toxic to houseflies, but harmless to humans. Ingestion of large amounts of black pepper might cause vomiting. *Knidios kokkos* (= *kneōron*) appears also in *Historia Plantarum*, VI, 1.4, as a spinless low-growing shrub. In IX, 20.2, the "Cnidian berry" has many

153. Kordofan gum (from the Sudan; *Acacia verek* Guill. & Perr.) is considered better than the old "gum arabic," or gum Senegal. See C. L. Mantell, *The Water-Soluble Gums* (New York, 1947).

154. Cf. Dioscorides, IV, 117, and Pliny, XXVI, 111.

155. Galen, XIV, 231, is much clearer: τῶν δακετῶν θηρίων. Cf. Dioscorides, IV, 57; Pliny, XXI, 168 and 169; and Vettius Valens (ed. Kroll), 127.29.

156. Cf. Dioscorides, II, 159, and Athenaeus, II, 73.

uses: its heating quality (*thermotēti*), along with its power to open up the bowels, and its use in pills to prevent throat burns make the *kokkos* quite beneficial.[157] *Kokkos* is from *Daphne gnidium* L., sometimes called the olive spurge, dwarf bay, mazereon, magell, and a number of other names, which yields (from the seed) a fixed oil and acrid resin, and (from the bark) mezerein and daphnin. A combined extract called mezereum was formerly used in medicine as a vesicant and epispastic. *Peukedanon* is also "heating" (*thermatikon*), and is used to make a sweating ointment, and the root is for the spleen.[158] *Peukadanon* is the sulfur wort (*Peucedanum officinale* L.), which gives (from the root) peucedanin (4-methoxy-5-isopropylfuro [1,3:6,7] coumarin), used in experimental animals in the investigation of antineoplastic agents. *Daukon* is some kind of wild carrot,[159] recommended as *thermatikon*.

Ampelos hē agria is also *thermatikon* and *drimu* ("pungent"), and is used as a hair remover, freckle remover, skin and leather smoother.[160] The plant is bryony (*Bryonia alba* L. or *B. dioica* Jacq.), which contains many "pungent" and toxic substances, including bryoamarid glycoside, bryonin, bryonidin, bryonicine, an oil, and resin. Once employed by physicians and veterinarians as a purgative, bryony has been replaced by more uniform drugs. *Drakontion* is a root that stops coughs when mixed with honey, and is probably the edderwort (*Dracunuculus vulgaris* L.).[161] *Thapsia* is again (as in IX, 8.3) *Thapsia garganica* L. ("the deadly carrot"), which purges "up and down" and which removes bruises.[162] Again Theophrastus lists *aristolochia*, as he did in IX, 13.3, with basically the same suggestions for its use. *Skammōnia* is the scammony (*Convolvulus scammonia* L.), as in IX, 9.1; here, in IX, 20.5, Theophrastus says that only the juice is useful, while in IX, 9.1, both the root and juice are included. No benefit comes in either listing, nor is there any more medicinal information in IV, 5.1. It appears that something has been omitted in the MSS,[163] as comparison with other Greek

157. Cf. Pliny, XXVII, 70; Dioscorides, I, 36; and Pliny, XV, 25; XXIII, 89.

158. Cf. Pliny, XXV, 117.

159. Probably *Malabaila aurea* L. here in IX, 20.2 (and IX, 15.8), as contrasted with δαῦκον in *HP*, IX, 15.5. Galen, VI, 654, and XI, 862, seems to be writing about another species. Cf. Dioscorides, III, 72, Nicander, *Theriaca*, 94, 858, 939; *Alexipharmaca*, 199; and *Scholia on Theriaca*, 94.

160. Cf. Dioscorides, IV, 181-183; Pliny, XXIII, 19 and 21; Galen, XI, 826.

161. Cf. Dioscorides, II, 167; Pliny, XXIV, 89.

162. Cf. Dioscorides, IV, 153; Pliny, XIII, 125 and 126.

163. Einarson, "Manuscripts of Theophrastus's *Historia Plantarum*," p. 70: "even in U* the concluding passage (9.19.4 through γίνεσθαι in Wimmer's text) is evidently incomplete."

and Roman medical sources would indicate.[164] Greek and Roman physicians valued scammony as a purgative, and it continued to be used until quite recently, because of its constituents, which include starch, ipuranol, a reducing sugar, a methylesculetin, dihydroxycinnamic acid, and resin (8-13 percent). *Pteris* is the male fern (*Dryopteris filix-mas* [L.] Schott.), which "expels the flat worm."[165] Modern medicine still values this very reliable antihelmintic, used as the oleoresin of aspidium (an ether extract of the male fern), which has at least 24 percent crude filicin. In humans, the drug is a stable antihelmintic, with various side effects (headache, yellow vision, colic, dizziness, and so on), that are easily controlled. Veterinary medicine uses the oleoresin of aspidium in the treatment of taeniasis, and against liver flukes in ruminants. This is one of the few pharmaceuticals from antiquity that has retained its value, in an era of ever more sophisticated laboratory synthesis.[166]

In *On Odors*, 35, *megaleion* is recommended as being a great help for all sorts of wounds. In *Historia Plantarum*, IV, 2.1 and 2.6, one finds a *balanos*, from which is made (*Odors*, 29) *megaleion* out of burnt resin,[167] and oil. Pliny (XIII, 13) says that the medicinal was named after Megallos, who invented it. *On Odors*, 35, notes that it is most effective when mixed with cassia cinnamon and myrrh. *Balanos* is probably *Balanites aegyptica* L., an Egyptian plant that bears a fruit like an acorn (hence the name).[168] The benefit for wounds came from the myrrh, *Commiphora myrrha* (Nees) Engl.[169] The last "herbal" would not fit Theophrastus's original definition, given in the beginning sections of this essay, but it would fit his notions of beneficial or harmful plants and their derivatives. In *Historia Plantarum*, IX, 20.4, one reads of the interesting *to tēs ebenou xylon*, ebony wood from *Diospyros ebenum* Koenig, the Macassar ebony, most common in India and Sri Lanka. This reference might be derived from some reports from India that appear in IX, 20.4, and the context of IV, 4.6, confirms this suspicion. In IV, 4.5, Alexander has ordered his men not to eat mango,

164. E.g., Pseudo-Aristotle, *Problems*, 864a4 and b13; Dioscorides, IV, 170, and V 73; Nicander, *Alexipharmaca*, 565; Pliny, XIV, 110 (as in Dioscorides, V, 73).

165. See also note 100, above. Cf. Pliny, XXVII, 145.

166. Hill, *Economic Botany*, p. 264, with a short summary. Harry F. Dowling, *Medicines for Man* (New York: Knopf, 1973), pp. 14-17, is very negative about the use and usefulness of ancient drugs: "Less than two dozen effective drugs were known before 1700" (p. 14). Aspidium appears on his short list.

167. Cf. Pliny, XIII, 7; Dioscorides, I, 58.3, and IV, 157.

168. *HP*, III, 8.3 (acorn), and IV, 2.6 (tree which has βάλανοι).

169. Cf. Celsus, V. 27 (myrrh for burns); Majno, *Healing Hand*, pp. 216-219.

and IV, 4.6, mentions the two kinds of ebony that occur in India. The second species is most likely *D. melanoxylon* L., which also occurs in northeastern Africa. It is probable that Theophrastus had some direct account of Alexander's expedition in India, but it seems that he combined this report of ebony wood with other, more local information.[170] In IX, 20.4, one reads that the wood, when rubbed on a whetstone, is useful for the eyes.[171] A section on ebony in Dioscorides (I, 98.1-2) solves the puzzle, because he picks up the same treatment, vaguely noted in Theophrastus; Dioscorides specifies the ebony and the manner of preparation of the eye salve. He says that the wood becomes yellow when rubbed on a whetstone, and that of the two kinds (Ethiopian and Indian), the Ethiopian is the better, because the Indian variety is streaked and spotted; furthermore, some try to sell other kinds of wood (like the acanthus) as if they were ebony (*Materia Medica*, I, 98.1). The eye salve (*kollyrion*) is prepared as follows (I, 98.2): the scrapings or dust of the ebony wood is steeped in Chian wine for a day and a night, then beaten into the consistency of eye salves (*kollyria*). Another method is to beat the scrapings and dust first, then sift then, and then soak them in the wine; some will use water instead of wine. A third method is to burn the dust and scrapings in a bowl, and then to wash the coals as one did white lead (*molybdos*).[172] Theophrastus has recorded a fragment of an apparently well-known remedy, and the state of the text may explain the strange omission of many details.[173]

There are forty-three major herbs and herbals (omitting IX, 18.3-11) in *Historia Plantarum* IX and *On Odors*. Five are toxic: mandrake (IX, 9.1), hellebore (IX, 9.2 and 10.1-4), the *strychnoi* (IX, 11.5-6), wolf's bane (IX, 16.4-7), and hemlock (IX, 16.9). There is one wood (Ethiopian or Indian ebony: IX, 20.4), and the male fern (IX, 20.5). Additionally, there is one animal product: the curd of the monk seal (IX, 11.3). There are no minerals, but *On Stones*, 23-24, notes that *smaragdos* is "good for the eyes."[174] The vehicles are wine, vinegar, honey, and water. If

170. "Local" in this case means Egypt, where the name originated. Herodotus, III, 97; Theocritus, XV, 123. Other references in *HP* suggest a kind of combination: I, 5.4 and 5; V, 3.1 and 2.

171. Cf. Pliny, XXIV, 89.

172. Cf. Galen, XI, 867-868.

173. Ebony dust (appearing in Dioscorides, I, 98) is omitted in Harald Nielsen, *Ancient Ophthalmological Agents*, trans. from the Danish by L. McBride (Odense: Odense University Press, 1974).

174. *On Stones* (ed. Eichholz, p. 64): *ἡ δὲ σμάραγδος . . . καὶ πρὸς τὰ ὄμματα ἀγαθή*. *σμάραγδος* may be green basalt, or green Aswan granite

Wellmann is correct,[175] Theophrastus derived many of his remedies from the works of Diocles, but it is clear that Theophrastus was a shrewd, independent collector of data in his own right,[176] including information on medicinals. The list of herbals assembled in *Historia Plantarum* IX became the direct ancestor of all later drug treatises in antiquity, and many traces of Theophrastus's (and Diocles's) original observations survive in the *Materia Medica* of Dioscorides. The analysis of the various plants and plant derivatives shows that the Greek *rhizotomoi* and drug-vendors had collected much valuable information on the medical employment of plants, and Theophrastus invented a format for this type of information that would be followed after his own time. Dioscorides adds many other names for the plants, so that the modern scholar can, in the majority of cases, key the genera and species, and thereby determine medical utility. Theophrastus's herbs and herbals show that, in the fourth century B.C., *pharmaka* were well known, and those that were especially beneficial and harmful had been carefully studied. It is to Theophrastus's credit that he used information supplied by the root-cutters and drug-vendors, who could either verify or refute many notions that might have become "common knowledge."[177]

(Eichholz, p. 103). Sometimes, according to Galen (XI, 867-868), ebony was confused with "stones."

175. See notes 13-17, above.

176. Sources and references are collected in Einarson and Link, eds., *Theophrastus: De Causis Plantarum*, xix-xxiii.

177. Lynn Thorndike, "Disputed Dates, Civilization and Climate, and Traces of Magic in the Scientific Treatises ascribed to Theophrastus," in Charles Singer and Henry E. Sigerist, eds., *Essays on the History of Medicine Presented to Karl Sudhoff on the Occasion of his Seventieth Birthday* (London: Oxford University Press, 1924), says Theophrastus "assures us that many remedies and antidotes have been brought to human notice by the example of animals who employ them" (p. 79).

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The Drug Lore of ASCLEPIADES *of Bithynia**

by John Scarborough**

ONE OF the most influential figures in Roman medical history is Asclepiades of Prusa, the major city of Bithynia in northwestern Asia Minor. Numerous sources, both medical and non-medical either mention him in passing, or take the trouble to recount his medical thinking and recall his remarkable career in the last century of the Roman Republic. It is, therefore, quite surprising that his writings have survived only in fragmentary form, in quotations given by other authors who often cite Asclepiades to refute him.

The modern scholar owes most of the extant material from Asclepiades to Galen and Caelius Aurelianus, both of whom rail against the false teachings of the renowned physician. Galen, with his constant beacon of teleological medicine before him, denies Asclepiades' mechanistic medicine. Galen's influence on subsequent medical philosophy was well in tune with his own century which witnessed Stoicism as the major philosophy, practiced by the emperor, Marcus Aurelius (A.D. 162–180). It effectively smothered any remaining impact of Epicurean-like medical philosophy.[1]

Caelius Aurelianus was a gifted translator of Greek medical works into Latin, and he provided summaries of Soranus and other Greek materials that had come down to his own time, the fifth century. Included in his synopsis are a good number of citations from Asclepiades' lost works, including those on drugs. Other fragments of Asclepiades' writings emerge from Celsus, Scribonius Largus, Pliny the Elder, Rufus of Ephesus, the *Anonymus Londinensis*, and the Byzantine court-physician, Theophilus Protospatharius.

Biographical details about Asclepiades are scant. Cicero notes that he was a friend of Lucius Licinius Crassus,[2] which places him in Rome about 90 B.C.[3] Pliny writes that Asclepiades had come to Rome, expecting to make a living in the teaching of rhetoric, but found medicine more lucrative, and thus switched professions with a minimum of effort.[4] Although most historians of medicine would agree with Wellmann's dismissal of Pliny's assumption that Asclepiades the doctor had once been a teacher of grammar and rhetoric,[5] a strong case can be made

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****Professor, Department of History, University of Kentucky, Lexington, Kentucky 40506.**

that Asclepiades of Prusa was indeed the well-known rhetor of Myrlea, by the same name. Myrlea was another city in Bithynia, about twenty miles from Prusa, the time of activity is roughly the same, and Sextus Empiricus quotes from an Asclepiades who appears to be both physician and grammarian.[6]

Asclepiades' medical teachings appealed to the Romans, since he avoided the great surfeit of terms and sophisticated philosophical reasoning characteristic of the Greek medicine coming to Rome.[7] There are many short accounts of his simplified medicine, general treatment, and effective relationships with his patients.[8] He became famous for his aphorisms, "the duty of the physician is to treat safely, quickly, and pleasantly;"[9] "treatment consists merely of three elements: drink, food, and the enema;"[10] and "the use of wine is hardly less equal than the power of the gods."[11] Fame also resulted from Asclepiades' deed of "raising a man from the dead,"[12] although the sources make it clear that the man had been prematurely prepared for his own funeral.

Gossip in the time of the Emperor Claudius (A.D. 41–54) told of some kind of scandal in the family of Asclepiades, supposedly involving murder or treason by his son-in-law.[13] The "treason," however, may be leftover rumors from the time of Pompey—who lost the gamble for power to Caesar at Pharsalia in 48 B.C. Asclepiades was part of the circle around Pompey, as proven by a dedication of one of his works quoted in Caelius Aurelianus,[14] to Geminius, a powerful associate of Pompey.[15] Finally, Pliny records that Asclepiades died in old age by a fall.[16] His career in Rome was long and illustrious, from about 95 to 45 B.C., given Pliny's statement about Asclepiades' elderly demise. His youth and old age remain obscured, unless one presumes Asclepiades of Myrlea was the same man, as Pliny did. If true, then his youth was spent in the court circles of the Bithynian king, and he died in Spain, while writing on the customs there.[17]

Asclepiades' medical philosophy was based loosely upon current Epicurean notions, the most basic being that all life (and death) was an accidental process, and that there was little validity in the assertion that life or its forms had any particular purpose (the teleological or Vitalistic view).[18] Wellmann is correct in noting that Asclepiades' medicine was "unoriginal,"[19] since his approaches to medical treatment had been anticipated by Heracleides and Cleophantus. Important for Asclepiades was Heracleides' concept of the small particles, the indivisible pieces of matter that made up all parts of the human body,[20] an idea derived ultimately from the "atoms" of Leucippus and Democritus,[21] and refined in some respects by Epicurus.[22]

IN THE last century of the Roman Republic, Epicurean/mechanistic ideas were in great vogue,[23] especially illustrated by the eloquent verses of Lucretius' *De rerum natura*. Groups of intellectuals gathered to study the philosophical ramifications of mechanistic concepts, and Cicero grudgingly acknowledges the popularity of the philosophy among the leading intellectuals of his time.[24] Excavations at Herculaneum have uncovered a library of one of these schools,[25] and there were probably many more. It was thus no accident that Asclepiades chose this outlook for his medical philosophy, and it is little wonder that his practice was so successful. It is, however, far from the truth to call him a fraud, as the

pharmacy below will demonstrate. He can be called an opportunist, and he did reject anatomy in favor of symptoms, but his medical view was firmly grounded in a carefully reasoned application of drugs and what today might be termed Common Sense. Given some of the awful prescriptions then offered as beneficial, one may sense the appreciative reception he gained from intelligent Romans who were told they had a good deal of knowledge about medicine, too.[26] One may also divine why the "professional" physicians of later antiquity excoriated him, especially in light of Galen's statement that he was pleased when patients regarded him as a worker of wonders and even magic.[27]

Most modern authorities, in their summary accounts of Asclepiades, write that he eliminated drugs from medicine. This may reflect a hurried reading of Celsus, V, prooemium, 2, which tells of the great use of drugs among the "ancient authorities" (*antiqui auctores*), including Erasistratus, Herophilus, Zeno, Andreas, and Apollonius Mys. Celsus continues by saying that Asclepiades dispensed "with drugs for the most part" (*ex magne parte*). In another passage, Celsus further qualifies what Asclepiades did with drugs. The Bithynian had done away with drugs that the ancients had used to "assimilate food during fevers, since they feared indigestion most of all."[28] Also, Asclepiades is given credit for being the "first to concern himself with anything more than what custom and tradition handed down to him" in medicine.[29] W. G. Spencer, in the introduction to Volume II of his generally excellent text and translation of Celsus' *De medicina* (Loeb), writes in this context: "Purgatives are comparatively few and treatment by clystering the bowel was preferred by Asclepiades, whom Celsus is inclined to follow."[30] Spencer thus defines one of the pharmaceutical principles followed by Asclepiades: there were very few internal drugs that he prescribed, although there are traces of a book he wrote, entitled *On Internal Remedies.*[31]

Misleading also is a rapid reading of the introductory section ("To Gaius Julius Callistus") of Scribonius Largus' *Conpositiones*. First, one reads, "but Asclepiades, the greatest medical authority, refused to give drugs to the sick."[32] Shortly, however, Largus adds—having said that Asclepiades "will have seen what he will have perceived," a thought difficult to grasp,[33]—"he denied giving drugs, because he judged rightly that occasionally giving food and wine cures patients completely. But for all that, in his book, entitled *Paraskeuon* (that is, "Preparations"), he asserts that it is the greatest alloted duty of the doctor not to follow some single thing with its flaws, or for that matter, two or three particular prescriptions which are proved and continuously experienced."[34] It seems that Asclepiades wanted a great variety in his drugs, as Largus goes on to say.[35] Celsus and Largus both quote prescriptions from Asclepiades' treatises, which were written in Greek. Largus' Latin reflects a good deal of street-level speech,[36] and his native tongue was Greek, while Celsus knew Greek in the manner of the Roman upper class in the age of Tiberius.[37] Other works of Largus are known through citations in Galen,[38] and it seems that the extant *Conpositiones* ("Prescriptions") was written at the request of Callistus, a freedman of the Emperor Claudius. Consequently, several points become clear from the citations of Largus and Asclepiades in Celsus, Galen, Caelius Aurelianus, and other extant sources: (1) Largus normally wrote in Greek

(2) Asclepiades' works were in Greek, although Largus may hint that the *Paraskeuon* was a bilingual text[39] (3) the drug lore of Asclepiades would be that of the Greek and Hellenistic medical traditions, as contrasted to the native Roman folklore-prescriptions often seen in Cato and Pliny, and (4) Asclepiades' prescriptions and notions about drugs were regarded with some esteem by later medical writers. The greatest number of drug-lists from the writings of Asclepiades comes from Galen, even while he fulminates against the dolts and poltroons who follow the mechanistic system of medicine (generally, the Methodistic Sect, which claimed Asclepiades as a direct ancestor).[40] It appears that Asclepiades left his greatest mark in later medical literature through his prescriptions and commentaries, not his medical philosophy.[41]

Asclepiades' drug theory was closely related to his general theory of disease. He believed, first of all, that in digestion, "absorption takes place from crude foods only."[42] The particles of food were extremely small, and indigestion came when the particles were too big. Thus illnesses generally occurred, when the "little bodies (*corpuscula*) were brought to a stop" in their passage through "the invisible pores" that filled the body.[43] It would be the task of the doctor to unclog the pores and passages. Wine and food in proper amounts were best in treatment,[44] followed by giving an enema, which would extract the improper food doing the damage.[45] As a logical consequence, Asclepiades believed that using drugs for purging was fruitless, since "all the substances were produced by the drugs themselves."[46] In giving this statement of Asclepiades' drug theory, Galen displays one of his professional snits while he writes at great length to refute Asclepiades and generally the Epicurean notions of medicine and pharmaceutical treatment. Galen is particularly aghast at Asclepiades' idea that it did not really matter if a doctor "gave a drug for the removal of water, or a drug which removed bile, since they all purge equally and dissolve the body, and produce a solution that has such and such an appearance, which did not exist in that state previously."[47] This seems incredible——and simply stupid—to Galen, who believed in the Hippocratic view of humors, and how drugs acted on those humors: "Some drugs purge away the yellow bile, others purge away the black bile, some others will rid the body of phlegm, while yet others will eliminate the excess water."[48] To Asclepiades, the whole concept of the humors was irrelevant in medicine, and drugs remained their own substance in all pharmaceutical therapy. Even though Mithridates of Pontus (d. 63 B.C.), the famous inventor of an all-inclusive antidote named after him, valued Asclepiades' drug-recipes,[49] Galen cannot refrain from hurling his bombast at Asclepiades for twenty and more pages of the Kühn edition of *On the Natural Faculties*.[50]

Most of Asclepiades' internal remedies are unknown, although traces of his *Peri ton entos pathon* (roughly, "On Internal Ailments") appear in Galen.[51] Wine, or wine with salt, probably was the major potion.[52] Many of the extracts in Galen, moreover, stemming from Asclepiades' drug treatises, were compiled previous to Galen's own time. Asclepiades' recipes are often jumbled together with those of Heras, Asonus (otherwise unknown: gives extracts from five books by Asclepiades on internal remedies for poisons. Galen, XIV, 135-146), Marcellus, Antonius Musa, and Dioscorides, among others.[53] The combination with Dioscorides is expected, since in the beginning of his

Materia Medica, Dioscorides notes that some of his major sources are "Asclepiadean."[54]

PLINY records a bit or two of Asclepiades' lost antidote writings, although isolation of Asclepiades from Dieuches and other earlier (and later) drug collectors is difficult. In his discussion of oxymel, Pliny says he is giving the prescription from Dieuches,[55] and the same formula is found in Dioscorides.[56] The prescription is the standard one for oxymel: ten minae of honey, five heminae of "old vinegar, a pound and one fourth by weight of salt from the sea, added to five sextarii of water." Then one was to boil the whole concoction in a large cauldron, taking it "off from boiling ten times," and then put it away for storage.[57] Pliny goes on to say that Asclepiades condemned oxymel,[58] much as Caelius Aurelianus says Asclepiades rejects oxymel in treatment of delirium.[59] In the next few lines, however, Pliny writes that Asclepiades "admits that oxymel was beneficial against the snake [or lizard] known as Seps as well as against poisoning by opium and mistletoe."[60]

The confusion in Pliny's account is explained by the manner in which Asclepiades' antidote books (as well as those by Mithridates of Pontus) became known after Pompey's day: "When Pompey conquered Mithridates, and gained all the spoils of war, he had his freedman Lenaeus translate all of the books [including those on drugs], belonging to Mithridates, into Latin."[61] If letters of advice did go from Asclepiades on the subject of antidotes, then Pliny probably had the Latin rendering of the whole collection—including Asclepiades' letters—before him. A similar process of amalgamation may be behind the cryptic reference in Pliny which reads, "Chamomile is most highly commended by Asclepiades."[62] Pliny then proceeds to give a prescription very much like that in Dioscorides,[63] after giving his readers six various names applied to chamomile, while citing only Asclepiades at the beginning of the section. He tells us that doctors make lozenges from the pounded leaves, blossoms, and even the roots. The drug is effective "against every sort of snake."[64] Even less can be deduced from the fragments of Asclepiades' antidote recipes as they are found in Galen.[65]

Much more remains of Asclepiades' recipes for mixtures to treat external problems, presumably derived from his writings of these subjects which appeared in great numbers.[66] Especially valued were his prescriptions for drugs that were intended for oral cavity and throat problems. Galen passes on a formula for a cough medicine from Asclepiades that contains Pontic rhubarb, Cilician crocus-saffron, opium, frankincense, myrrh, Celtic nard, and storax, all "administered with honey mixed with wine."[67] The cough medicine prescription appears in a collection Galen (or some compiler who put this piece under Galen's name) had made of such recipes from Crispus the Freedman, and Scribonius Largus. Asclepiades' concoction, given by Galen, is rather aromatic, and contained most likely the dried stigmata of *Crocus sativus* L., olibanum which is the gum-resin from several trees of the genus *Boswellia* (frankincense), the gum-resin from *Commiphora* spp. (myrrh) of certain shrubs of Arabia and East Africa, an aromatic substance made from *Nardostachys Jatamansi* DC. (various types of nard, including Spikenard) commonly used in classical pharmacy,[68] and a sweet smelling oleo-resin produced from the inner bark of *Liquidambar orientalis* Mill. (storax). Opium was the analgesic, and its use and production had been

recorded by Asclepiades, long before Galen put down *his* account.[69] Pontic rhubarb was widely used in classical antiquity for its pungency,[70] and the honeyed wine made the whole quite palatable.

Asclepiades chose with care his prescriptions. His cough syrup would

The modern scholar owes most of the extant material from Asclepiades to Galen and Caelius Aurelianus. Robert Thom's painting (above) offers an artist's reconstruction of a scene showing Claudius Galen preparing a cold cream for a patient. (From the Parke-Davis *Great Moments In Pharmacy* series.)

have some salutary effect. Olibanum is still useful as a stimulant expectorant as well as in the common incense. The stigmata of *Crocus sativus* L. sometimes are employed in the treatment of asthma. Myrrh remains useful as an effective astringent and tonic, and has some use for treatment of oral cavity diseases in mouthwashes. Storax was thought good for treatment of inflammation of the mucous membranes in general. Patients would have been grateful for this recipe, and Galen records it with some respect.

Scribonius Largus records a detailed recipe for an arterice, the general and common name applied to medicine for the windpipe.[71] He writes that there is "no better arterice than the one which is given by our own Asclepiades, who is one of the more capable men in all of his statements, and, especially in whatever injury there might be in the trachea (*in arteria*)."[72]

> It is composed of the following: the best fatty myrrh, by weight, 23 denarii;[73] white tragacanth, by weight, 28 denarii; root of the licorice, by weight, 28 denarii; resin of true terebinth, by weight, 28 denarii.

Further on the preparation of the arterice, as put down by Asclepiades, include pounding the tragacanth, straining it through a sieve, taking the crushed myrrh and mixing again each part of the two substances for a long time until they became as one. Then one ground them together in a mortar, and when "they will become hot by the stroke of the pestle, then, little by little, mix in the terebinth until they are all made as one."[74] Then comes the addition of the licorice which has been pounded and passed through the sieve. "One ought to sprinkle gradually it into the mixture. When these things will have been well

mixed, and while the drug is hot, much of it can be made, and some added, into little pills (*pilulas*) about the size of beans."[75] Largus now speaks on his own behalf, having quoted Asclepiades. "This arterice becomes, in fact, very hard, and in this itself it excells all the others, because it does not dissolve quickly while it lies under the tongue, and thus produces its effect for a long time."[76]

As an aromatic throat lozenge, Asclepiades' arterice again contains substances that were beneficial for the purposes stated. The myrrh, as in Galen's quotation above, is good for oral diseases, and the licorice (*Glycyrrhiza glabra* L.) is an excellent demulcent and expectorant. Mixed with fifty parts of water, the tragacanth (*Astragalus gummifer* Lab., and other spp.) forms a gummy substance which soothes mucous surfaces. The "true terebinth" (*Pistacia terebinthus* L., turpentine) oil is occasionally used as an expectorant.

RUFUS of Ephesus, a physician of great skill who practiced in Rome in the reign of Trajan (A.D. 98–117), has left an interesting recipe from Asclepiades on "stones of the throat." It is clear in this instance, as in the other cited recipes, that the Asclepiades given by Rufus, is not Asclepiades Pharmakion, since the latter physician is specifically named and cited in another section.[77] The Greek text of this passage is an excellent example of Asclepiades' repute in later antiquity (the section is recorded in Book XI of Aetius of Amida, physician of Justinian's reign, A.D. 527–565; Aetius has extracted it from Rufus, who, in turn, took it from Asclepiades' works), as well as his range and skill as physician and pharmacologist. The passage runs:

From Asclepiades, with reference to those suffering from stones: a powder of the balsam tree fruit, when the stone is found in the glands of the throat; juice of the pennyroyal, marsh mallow seed, "soda" (*nitron*); having pounded each in a mortar and having sifted it, put it away in storage, and give, as required, one spoonful with three ladlesful of diluted wine.[78]

The balsam "fruit" could be any one of several varieties from the genus *Commiphora*, all of which produce a fragrant, oleo-gum resin employed in healing mucous membrane inflammations, and as a general wound healer and expectorant. The pennyroyal (*Mentha pulegium* L.) is a common aromatic stimulant of folk medicine. Marsh mallow seeds (*malaches agrias spermatos* in the Rufus text, the same as the usual *alathaia: Althaea officinalis* L.), leaves, and roots are dried and make up a syrup and demulcent useful in mouth and pharynx irritations. The *nitron* is somewhat puzzling, until it is recalled that the Romans did not distinguish "soda" from potash, which is impure potassium carbonate, the Salt of Tartar (K_2CO_3, water soluble), used in skin diseases. *Nitron* as "soda" becomes saltpeter, either potassium nitrate (KNO_3) or sodium nitrate. Potassium nitrate is used in asthmatic powders combined with stramonium leaves. The ingredients make good sense, in light of the pharmacopaea of the time.

"Stone in the tonsils" suggests something of Asclepiades' own practice, and rather well refutes Wellmann's assertions that Asclepiades avoided the "nuisance of patients."[79] Anatomically, as is known from Galen,[80] *ho spongos* would include all the "spongy substance" in the throat: the tonsils, the various glands, and the remaining tissue which can become swollen and inflamed. This means *ho spongos* would include both tonsils and adenoids, as part of Waldeyer's ring of lymphoid tissue that encircles the nasopharynx and oropharynx. The diagnosis of "stone in the throat" of Asclepiades is possible through personal examination only, in

several ways. Digital palpation of the nasopharynx can reveal adenoid hypertrophy, which is firm and something like a "stone." Swelling of the lymph nodes at the ramus of the jaw in acute tonsillitis is another possibility. Acute tonsillitis also has the "diphtheritic membrane" sometimes over the gland, and is occasionally spotted yellow, and could, by eye, be mistaken for something like a "stone." The probability, however, is a true tonsillolith, or the more common salivary calculus. In all of the potential diagnoses, Asclepiades would have to come to his conclusions through personal observation. Indeed, he had patients.

The Rufus passage also uses terms, having to do with drug compounding, that Asclepiades had invented. He apparently was the first to use *katapastos* in its specific meaning of being "sprinkled or being spattered and being suitable for use as a powder" in pharmacy.[81] Likewise, he coined the specific meaning for *kopteon,* "one must pound drugs."[82] The peculiar sifting of drug-powders also was used by Asclepiades first, in the specific *setho.*[83] It is little wonder that he was regarded as the best example of Greek medicine to arrive in Rome by those who knew him, and by authors like Largus and Celsus who quoted him in the early years of the Empire.

Asclepiades was a great believer in sternutatories, if Caelius Aurelianus has quoted accurately. In delirium, he administered sneeze-inducers and errhines like "pepper, soapwort, and white hellebore."[84] In what Caelius Aurelianus calls lethargy, Asclepiades prescribed castor, rue "and vinegar, and also cow-parsnip, fleabane, and agnus castus as well as bayberries."[85] Better yet would be "a mixture of powdered mustard and vinegar," and that would work best "as a plaster for the head."[86] On a milder side, however, he prescribed a simple poultice called *omelysis* for women and children with tetanus,[87] which would also be good for the throat. *Omelysis* turns out to be small bags containing hot bran or raw flour.[88]

Celsus probably gives Asclepiades a more balanced treatment than does Caelius Aurelianus. Celsus calls Asclepiades, "the most excellent *auctor*,"[89] and does not emphasize errhines in Asclepiades' prescriptions and suggestions for throat troubles. Rather, we read that "he said that very sour vinegar should be sipped; by this means, the ulcers are lessened without doing damage. But although vinegar can slow the bleeding down, it is not able to heal those same ulcers. Better for this purpose is lycium, and Asclepiades commended this substance also in equal manner, or leek, or marrubium juice, or almonds pounded up with tragacanth and mixed with raisin wine, or flax-seed pounded and mixed with sweet wine."[90]

The substances listed by Caelius Aurelianus are, indeed, rather stiff, a great contrast to the Asclepiadean materials found in Celsus, Galen, Largus and Rufus. Pepper would cause sneezing without much doubt. Soapwort (of the genus *Saponaria*) must be meant here as some kind of binding agent, or used as a detergent, or, perhaps Caelius Aurelianus does not fully understand his pharmacopoea. The white hellebore was *Veratrum album* L., but most commonly used was *Helleborus niger,* "black hellebore," which has a digitalis-like effect on the heart, and can function as a cardiac and arterial tonic, diuretic, and cathartic. Fleabane (as Drabkin, p. 144, renders *conidia*), agnus castus (the "Monk's Pepper Tree:" *Vitex agnus-castus* L.) and bayberries (the fruit of *Laurus nobilis* L.) rest in that class of antispasmodic drugs. Vitex was once

thought to be a powerful aphrodisiac. Castor (the dried preputial follicles of the beaver, *Castor fiber*, from two inguinal sacs) appears elsewhere in Asclepiades' pharmacy, and the stench may have served to identify the preparation as "medicinal." Rue (the leaves of *Ruta graveolens* L.) functions as a carminative and rubefaciant. Vinegar is one of Asclepiades' favored all-round remedies, and sounds genuine. The combination of vinegar with mustard as an external remedy (a plaster for which Asclepiades was famous) is historically valid. Mustard (dried ripe seeds of *Sinapis alba* L., and *Brassica nigra* (L.) Koch, has a minimum of .6% allyl isothiocyanate, depending on temperature, altitude, and so on) was used as an emetic, rubefacient, and condiment. Caelius Aurelianus is correct in grumbling about such remedies, but one may wonder why these remedies could be so unlike other sources on Asclepiades' drugs. Possibly compilers, who put together much of the material that appears under the names of Soranus (in the renditions of Caelius Aurelianus) and Galen, had conflated many authors beyond individual recognition.

Celsus' listings are more to the point, and are consistent with other Asclepiadean recipes. Again, vinegar appears, a substance as common in Asclepiades' prescriptions as wine. Lycium may be the juice of the boxthorn (*Lycium barbarum* L.), but there is much controversy over lycium, or *lykion*, as in Dioscorides, I, 100. Opinion leans against the genus *Lycium* and now favors *Rhamnus* spp., perhaps *R. cathartica* L., or *R. infectoria* L. Lycium's use and function seem uncertain. Leek (*Allium Porrum* L.) is a relative of the onion. Horehound juice, (*Marrubium vulgare* L. as in Dioscorides, III, 105) becomes an expectorant in candy form, and a diaphoretic. Almonds, like the leek, are foodstuffs, and tragacanth, as noted in the Largus passages above, is used as a soothing agent for inflamed mucosal linings. Flax-seed is the common linseed, made into oil and then mixed with sweet wine, as contrasted to the resin-wine mentioned previously. Wine and vinegar, leek and horehound, and almonds: generally beneficial and directed to the purpose at hand. One must, therefore, use the materials in Caelius Aurelianus with some caution, since they have a unique character all their own in regard to Asclepiades. It may be that the fifth century writer has recorded materials and recipes missed or omitted by earlier compilers, but it is more probable that Caelius Aurelianus inherited a confused textual tradition as well as a hostile view of Asclepiades. The fifth century is well within the era dominated by Christianity, a general outlook that has little tolerance for mechanistic, accidental hypotheses about life, death, and the gods. Nearer to the truth are Celsus, writing in the reign of Tiberius (A.D. 14–37), Scribonius Largus in the time of Claudius (A.D. 41–54), and Galen (*c.* A.D. 130–*c.* 200). These three authorities cite Asclepiades with respect, even though all three differ from him in outlook and direction.

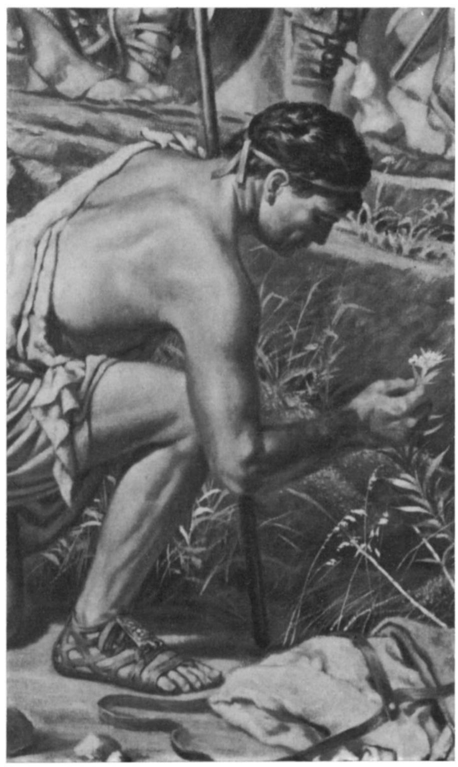
Related to Asclepiades' drugs for throat affections were his preparations for ear and nose disorders. Nasal polyps were of great concern to the Romans, and there are traces of Asclepiades' recipes and advice for their treatment.[91] Ear malfunction often was due to cerumen accumulation, and the doctor always had a good ear scoop among his tools.[92] Celsus records one of Asclepiades' "general remedies" for ear cases,[93] and there are fragments of a similar prescription from Asclepiades in Galen.[94] Whether or not Celsus speaks for

himself, or whether he is quoting Asclepiades' words in saying that the recipe is "one approved by experience,"[95] the prescription is consistent with other known Asclepiadean ingredients. The remedy put together by Asclepiades was:

Cinnamon and casia, by weight, one denarius each;[96] flowers of the round *iuncus*, castor, white pepper, long pepper, cardamon, and myrobalanum, by weight 2 denarii each; male frankincense, Syrian nard, fatty myrrh, saffron, and *nitrum*, by weight, 3 denarii each. Pound separately, then mix with vinegar, and pound it all again to preserve it. To use it, the mixture will be diluted again with vinegar.[97]

Ingredients in this prescription, which have not appeared in the recipes of Asclepiades, cited previously, include two kinds of cinnamon, *iuncus*, cardamon, and myrobalanum. Castor, pepper, frankincense, nard, myrrh, saffron, and *nitrum* (Greek *nitron*, "soda") have all been delineated in other prescriptions. Medical cinnamon came from the inner bark of *Cinnamomum Loureirii* Nees., "Saigon Cinnamon," and was used as a cordial (well in line with Asclepiades' liking for alcoholic mixtures) and carminative. This type of cinnamon is not the spice, *Cinnamomum zeylanicum* Nees., "Ceylon Cinnamon."[98] The second kind of cinnamon (*casia*, Greek *kasia*, undetermined) listed by Asclepiades in his ear remedy, is some other type of cinnamon used in classical antiquity specifically in perfumes (as in Largus, XXXVI, and Pliny, XXXVII, 78. 204). *Iuncus* or Cyperus is an unknown rush, probably related to the English Galingale (*Cyperus longus* L.) which has astringent and aromatic roots. Cardamon is the dried ripe fruit or seed of *Elettaria cardamomum* (L.) Maton. (of India and Ceylon) and is employed as a carminative. Myrobalanum (Greek *myrobalanon*), sometimes rendered as "behen-nut," was made from the fruit of *Moringa pterygosperma* Gaertn., a palm tree, and gave an oil as recorded in Pliny, XII, 46. 100. Vinegar is again Asclepiades' general medium. The salve would be soothing and would smell rather exotic.

Salves and plasters were Asclepiades' favored treatments, when food and wine did not cure. For cardiac disease, which he defined as an "inflammation in the heart" according to Caelius Aurelianus,[99] Asclepiades made up a mixture containing pepper, sulfur, cachry, gum ammoniac, silphium, and old Sicyonian olive oil. In addition, he prepared plasters with silphium and undesignated bulbs, and used them as dusting powders as well. A combination



Dioscorides, first century AD investigator of drugs, quoted Asclepiades as an authority in his writings. (Detail from "Great Moments In Pharmacy," courtesy of Parke-Davis).

of quicklime and pepper was attributed to him for treatment in the same disease.[100]

THIS entire section in *Acute Diseases* is an apparent multi-combination of many sources, since "Asclepiades among others" prescribe the materials. Similarly, the quotation from Asclepiades' *Celerum vel acutarum passionum* ("Swift Illnesses") in *Acute Diseases* (III, 4. 34) is such a composite that one is left in doubt who indeed the author might be. The section is devoted to the treatment of sore throats (*synache*), and we read that Asclepiades had used bloodletting, bowel purges, various poultices, mouthwashes, gargles, and ointments. The salves had ingredients like hyssop, marjoram, thyme, melilot, wormwood, figs, *nitrum*, stavesacre, centaury, elaterium, ox bile, and cedar oil. Bloodletting was generally opposed by Asclepiades, and bowel purges were used only rather as a last resort—before beginning new drug therapy. *Nitrum* and the liberal use of wine throughout the treatment for both sore throats and heart trouble is accurate. Of the remaining ingredients, one is of interest in its own right: silphium. In *Acute Diseases* (II, 38. 219), it is classed under "pungent foods" like garlic and other pickled fare. Widely used in Greek and Roman pharmacy, silphium came from Cyrenaica and figured on coins from that area's cities, suggesting its importance in commerce. The plant remains something of a mystery, since it became extinct sometime in the Roman period.[101] Cyrene and Barca may have practiced a carefully harvested monopoly with it, and the chaotic years of the late Hellenistic period (150–30 B.C.) may have led to overharvesting and silphium's eventual extinction in the first or second century of the Roman Empire. From Asclepiades via Caelius Aurelianus, we can at least determine that silphium was in the plant class with garlic, because of its fetid and nauseating odor. Dioscorides (III, 80) places it among general herbs, with Melanthion (*Nigella sativa* L.) and *sagapenon* (*Ferula persica* Willd.). Perhaps Cyrene and Barca overfarmed their unique resource.

Galen (XIII, 341) gives a salve-recipe from Asclepiades as excerpted by Marcellus. Fortunately, Celsus gives the same recipe, and we can gain a good view of Asclepiades' skills in compounding what today might be called a skin-softener. It is recommended for a myriad of problems: it is an emollient for the liver and spleen, abscesses, scrofulous tumors, parotid swellings, etc.

> Opopanax, storax, galbanum, resin, by weight, 2 denarii each; ammoniacum, bdellium, wax, beef fat, dried iris, by weight, 4 denarii each; cachry, one acetabulum;[102] 40 peppercorns, all pounded with ointment of iris to the correct consistency.[103]

The prescription gives some new ingredients from Asclepiades that are worthy of consideration. Opopanax is a fetid gum-resin obtained from the roots of *Opopanax Chrionium* (L.) Koch, a yellow-flowered umbelliferous plant that resembles the parsnip. It grows in the Near East and the Balkans, and was used in perfumes and soaps. Storax has received attention above, in the cough medicine of Asclepiades, quoted from Galen (XIII, 67). Galbanum is the gum-resin from a Syrian plant, *Ferula galbaniflua* Boiss., and used as a local counterirritant. Ammoniac is the resinous gum traditionally obtained from a "tree near the Temple of Ammon in Egypt," but which comes from the plant of western Asia, *Dorema Ammoniacum* Don., and is used as a counterirritant in the form of an Ammoniac Plaster. Classical sources confuse this kind of ammoniac with Sal

Ammoniac (NH_4Cl), the "Salt of Ammon," an opaque, crystalline salt, supposedly prepared from camel dung near the Temple of Jupiter Ammon in Egypt. This is the Muriate of Ammonia, used in tinning iron and in pharmacy, and in the manufacture of ammonium for the dyer. Pliny (XXXI, 39. 73 and 79) seems to confuse this with some salt pits of Sicily, while Asclepiades (in Galen, XII, 410) makes careful distinction in his suggestions for the treatment of alopecia.

Bdellium is the fragrant gum from *Commiphora africana* Endl., a common adulterant of myrrh. The wax comes from bee honeycombs, which contain myricin, cerin, melissic acid, heptacosane, and hentracontane, used in the preparation of salves, ointments, and plasters. Iris is sometimes used as a cathartic (*Iris florentina* L.). Cachry is the catkin of a nut-tree (Greek *cachros*) or willow, and is an ament, a spike of the unisexual apetalous flowers, normally displaying scaly, deciduous bracts. Peppercorn is the dried berry of the black pepper (*Piper nigrum* L.), frequently used as a condiment. The salve would be beneficial, or as Celsus notes in his clipped manner, would be "useful."

IN AN EXTENDED fragment of Asclepiades' *On Alopecia* (in Galen, XII, 410-413), various drugs are prescribed along with some bizarre treatment. *On Alopecia* is worthy of detailed consideration in its own right, but one may profit from a rapid overview of the methods and ingredients prescribed by Asclepiades. *Aphronitron* ("washing soda"), along with rock salt (the *halos ammoniakou*) appear first, followed by sharp vinegar, then made into a plaster. The doctor needs "no other drugs ... unless the bald spot is of truly a great size."[104] He then suggests shaving, which is "opposed by others," Galen's only comment.[105] More drugs follow for the serious varieties of alopecia. Asclepiades recommends a "dry-land basil [or hedgehog?], a burned seahorse, a small amount of *nitron*, having been mixed with goose fat; having cleaned it all beforehand, smear the alopecia with it."[106] More substances follow. Mouse dung, emulsified with vinegar, the ashes of burned Reed of Cyprus, and a combination of fly-blood and *nitron* completes his treatment. In modern treatment of mange (alopecia; baldness), small areas of the scalp are sometimes lacerated and then an injection of 1% triamcinolone acetonide is administered. This is, of course, not what Asclepiades had in mind when Galen writes, "Asclepiades recalls something about flies. Catching them, he ordered immediately that as many of their heads as possible be pressed into the bald areas of the alopecia, especially, he says, when we lacerate it."[107] It may be that Asclepiades had noticed improvement in bad cases of mange when small pricks were made in the skin, and the smallest, sharp parts he could think of were the flies buzzing around. Galen makes no comment about the treatment itself. Its inclusion, however, means implicit approval of the method. The plasters (*malagmata*) invented by Asclepiades —like the one at the beginning of the section on mange—are quoted in great numbers by Galen, who will occasionally take other collections of recipes and include them in his own books.[108]

In the prescriptions reviewed, there are seventy different substances, in a total of 116 citations of materials. Forty-nine are listed once, while sixty-seven have two or more listings. In the multiple citations, wine and vinegar have eighteen, plant foodstuffs have seventeen (with various grains having six within this

class), animal products (animal fat, castor, etc.) have seven citations, minerals have eight (with *nitron* in five cases), and insect products (wax, honey) have three. The following have two each: ammoniac, cachry, castor, rue, resin, honey, horehound, saffron, frankincense, storax, nard, tragacanth, figs, and cinnamon. Four references are given to myrrh, and three are devoted to silphium. The remainder are given to various inedible substances, like the one citation of opium and so on. Dominating Asclepiades' pharmacopoea is wine, verifying the Roman name for him, "The Wine Giver." Vinegar supplies him with a constant diluting agent. Most ingredients, however, fall into the categories of foodstuffs—expected from his medical dietetics, or generally harmless (when used carefully) aromatic materials derived from plants. Exceptions are the opium and hellebore, cited once each, and the latter may be suspect in the text of Caelius Aurelianus, perhaps derived ultimately in a garbled way from Asclepiades' letters to Mithridates. Minerals form a small minority, and the *nitron* comprises five of the eight entries. Asclepiades' drug lore thus falls within the normal pharmacy of classical antiquity, represented at its best by Theophrastus and Dioscorides, and Asclepiades.

THE NUMEROUS parallels in Dioscorides' *Materia medica* to some of Asclepiades' recipes show that Dioscorides valued Asclepiades' materials—or at least the approaches to pharmacy his immediate successors followed. Celsus thinks Asclepiades' medicine was usually quite sound, and quotes him with great respect. Scribonius Largus believes he was one of the finest practitioners of medicine in the recent past, and Pliny frequently lists him as one of his "foreign authorities." Rufus of Ephesus quotes Asclepiades, notably from one of the prescriptions, and the great polymath and physician of the second century, Galen of Pergamon, quotes Asclepiades very often, even while fuming at his mechanistic views. In the fifth century, Asclepiades is cited side by side with the revered Soranus, one of the best gynecologists of any age, and Asclepiades left traces in later Byzantine medical works. Widely respected and quoted in antiquity, his influence was eclipsed by Galen, who set the system of medical theory for a millennium.

Interest in Asclepiades was revived in the seventeenth and eighteenth centuries, when physicians rediscovered his remarkable insight into medical practice, an insight that fit well into the skeptical time that produced Edward Gibbon and many other anticlerical intellectuals. The overriding mood, however, both after Galen and following Gibbon's century (his *Decline and Fall of the Roman Empire* first appeared in 1776), was against the accidental "Epicurean" medicine represented by Asclepiades. He gave too much of the knowledge of medicine in forms that were easily understood by his patients. In the last century of the Roman Republic and in Galen's time—as well as our own—the vast majority of patients demand the feeling that their doctor really is smarter than they are, and, more importantly, that the physician indeed functions as did the medicine man of deep antiquity. For all of his brilliance, Asclepiades demanded too much of his patients. He demanded that they think for themselves, and taught that much they feared was simply created within and reinforced from without by convention.

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17. Pliny, XXVI, 7. 12-13. If Asclepiades of Myrlea is the same man, then there are good pieces of evidence documenting his youthful thinking on grammar and rhetoric, and one reference to his old age in Spain. B. A. Müller, *De Asclepiade Myrleano* (Leipzig, 1903) puts together the materials for Asclepiades of Myrlea. Numerous references to his works are given in Athenaeus (esp. II, 50 d-e, where Asclepiades of Myrlea is quoted from his descriptions of bushes, the fruit of one in particular "which causes sleepiness like wine for those who eat too much, and causes headaches." Other passages in Athenaeus bear resemblance to later teachings by the physician, Asclepiades). Sextus Empiricus (himself a doctor of the "Methodistic" persuasion, the sect that originated in the teachings of Asclepiades, the physician), *Against the Professors*, I, 12. 252 and 255, and I, 13. 307-308, identifies only an "Asclepiades" when he writes of grammar and medicine. In his *Outlines of Pyrrhonism, II* 10.98 and 12.140, Empiricus notes Asclepiades' ideas of invisible pores. "Straight" medical passages occur in *Against the Professors*, III, 5, and in *Outlines of Pyrrhonism*, III, 6. 32. Asclepiades is called only "The Bithynian." Strabo, III, 4. 3 and 19, notes that Asclepiades was writing books on the customs of Spanish tribes in his old age. The Byzantine encyclopedia of the tenth century, the *Suda (Suidae Lexicon*, ed. A. Adler [Stuttgart, 1929–1938 (Teubner); rptd. 1967]; the biographical sketches come from Hesychius of Miletus who lived in the fifth century), I, No. 4173, says that Asclepiades taught grammar in Rome in the time of Pompey.
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26. Pliny, XXVI, 7. 13.
27. Galen, XIV, 631, and XVIII, 2, 40 (Kuhn).
28. Celsus, III, 4. 2.
29. Celsus, *Prooemium*, 11.
30. Loeb Classical Library edition of *De medicina*, II, xi.
31. *e.g.* Galen, XIV, 135-146, beginning with Περὶ τῶν ὑπ' 'Ασκληπιάδου γεγραμμένων κατὰ τὸ ἑ. τῶν ἐντὸς παθῶν, ὁ 'Ασωνος 'επιγράφεται, which appear to be five books by Asclepiades on internal remedies for

poisons, as excerpted by otherwise unknown Asonus.
32. Scribonius Largus, p. 3 (Helmreich).
33. *Ibid.* Viderit Asclepiades, quid senserit.
34. *Ibid.*, pp. 3-4.
35. *Ibid.*, p. 4: Vides ergo, quam non placeat Asclepiadi usus medicamentorum, cui nisi plura quis ad quoque genus vitii medicamenta conposita habeat...
36. G. Helmreich suggests this in his introductory remarks (n. 7, pp. iv-v) to his edition of the *Compositiones* (Teubner, 1887).
37. Celsus, *Prooemium*, 49, 54, and 69, seem to suggest reading Greek texts. Spencer lists other passages in his edition of *De medicina* (Loeb), I, xii.
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45. Celsus, I, 3. 18.
46. Galen, *On the Natural Faculties*, I, 13 (trans. A. J. Brock, Loeb, p. 65). Galen (Kuhn), II, 40.
47. *On the Natural Faculties*, I, 13 (p. 64 Loeb; slightly altered from the Brock rendition on the facing page).
48. *Ibid.*
49. Pliny, XXV, 3. 6 and 7. G. Watson, *Theriac and Mithridatium* (London, 1966), 8, 15, 31, and 34.
50. II, 30-56.
51. Gale., XIV, 135-146.
52. Caelius Aurelianus, *Acute Diseases*, II, 39. 228.
53. *e.g.* Galen, XIII, 108 (from Antonius Musa); XIII, 967-976 (on Asclepiades' plasters mixed with those of Heras and Dioscorides, from Lucius, Marcus Telentius Asclepiades, and Heras); XII, 730 (on Asclepiades eye remedies from Marcellus and Herocleides); XII, 684 (an extract from Asclepiades' work on external remedies, esp. nasal polyps, as culled by Meges).
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71. Vitruvius, I, 6. 3. Celsus, V, 25. 17.
72. Scribonius Largus, LXXV (p. 32 Helmreich).
73. Scribonius Largus, p. 6 (Helmreich) explains the system he will use for weights and measures: Erit autem nota denarii pro Graeca drachma: aeque enim in libram 𐆖 octoginta quattuor apud nos, quot drachmae apud Graecos incurrunt. This means that 84 denarii will equal a Roman pound (librum), the same system for drug measures employed by Celsus, V, 17. 1C. I have chosen to render the weights in their Roman terms, but W. G. Spencer, II, lxv)-lxvii of his edition of *De medicina* (Loeb) chooses to convert the Roman terms into modern metric equivalents. The librum (pondus) was equal to about 336 grams, and the denarius (and the Greek drachma) to about 4 grams. An acetabulum consisted of about 63 cubic centimeters. The symbol, P, followed by a numeral (in Celsus, and, since the system is the same, in Scribonius Largus) means *pondus* (librum), one or more; P without a following numeral is *pondo*, "by weight." 𐆖 followed by a number is one denarius or more.
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75. *Ibid.*
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78. Rufus of Ephesus, 574. The "ladle" in the translation is an Attic measure (the cyathus, about ½ pint, equal to 2 konchai or "shellsfull," in turn equal to 4 mystra or "spoonsful"). The "ladle" measure is employed in Galen, X, 516, and XIX, 753, and the "spoon" is in Dioscorides, III, 22, and Galen, XIII, 57 and XIX, 770.
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83. Galen, XIII, 324 and 342.
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108. *e.g.*, Galen, XIII, 341-342.

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Gnosticism, Drugs, and Alchemy in Late Roman Egypt

by John Scarborough*

THE CONFUSION of late Hellenistic Jewish thought shrouds the origins of Gnosticism, but there is general agreement that several elements were important in its summary form, reached in the third and fourth centuries. Gnosticism arose from a complex combination of Hellenistic philosophy, Iranian religious teachings, Christian offshoots, and heterodox Judaism.[1] Those thinkers who espoused Gnosticism in the early Christian centuries were devoted to an interpretation of Divinity and its relation to man that taught a sort of pre-cognitive Knowledge (*gnosis*) as well as mythology which freed men from the shackles of belief in astrology, the tyranny of Creation, Old Testament law or any law, and even the god of the Old Testament.[2] The relation between God and sin, and between man and sin, mark the major themes in the fantastic cosmologies of the various Gnostic sects.

A Supreme God was transcendant, and He induced emanations that resulted in a number of inferior gods, which the Gnostics called Aeons. The Aeons were attributes of the Divinity, but in this group of celestial beings (*pleroma*) sin occurred which brought about the fall of one of the lesser gods. The discredited god then created the material world, including man, who reflected the transgression of his faulty creator (a *demiurge*). Man, therefore, had to separate his soul from the error-prone casing of the body. Christian Gnostics thought this could come through the Divine *Logos* ("Reason") seen in Christ incarnate as Jesus. Jesus, in turn, provided *gnosis* to comprehend the *pleroma*.[3] Divinity gave the revelation of *gnosis* through an experience of ecstacy which arrived "through the eyes of the soul."[4]

Hermetic, quasi-medical, and mystic philosophical works were, from the very first, part of the

*Presented before the Section on Contributed papers of the American Institute of the History of Pharmacy, April, 1971. Dr. Scarborough is Professor in the Department of History, University of Kentucky, Lexington, Kentucky 40506.

Gnostic tradition.[5] Stoicism provided Gnostics with solid arguments for a *logos*,[6] and hints of alchemical material occur quite early in Gnostic history.[7] Stoicism received many non-Greek concepts into its thinking, particularly those from Babylonia, and the Stoic teacher Poseidonius (*c.* 135-51 B. C.) allowed astrology to become an acceptable portion of Stoic thought. Although later alchemical and gnostic writers garnered much from Stoic doctrines, the alchemists firmly rejected astrology and its implications of predestination.[8] Drug lore was also entrenched within alchemical thought, and the alchemists' desire to gain insight into transmutation principles was coupled with collection of pharmaceutical recipes from Dioscorides and Galen.[9]

Although alchemical lore is supposed to have arisen with the Greek philosopher, Democritus,[10] formal definition of the secrets and objects of alchemy did not occur until sometime in the first and second centuries within the matrix and concepts of Gnosticism.[11] A mysterious Pseudo-Democritus put down a collection of recipes in the first century,[12] and the book was divided into four parts: how to make gold, silver, gems, and purple.[13] Behind Pseudo-Democritus was an ancient tradition of craftsmen's notebooks, and bits of information from Egypt, Persia, and Syria are apparent in his *Physica et mystica*. [14] The craft-tradition with its practical emphasis is undervalued as the treatises look to the transmutation of matter. Metals changed colors in alloy processes, and Pseudo-Democritus sought methods of tingeing, tinting, varnishing, and alloying one metal to make it appear like another, in particular to make a base metal resemble gold.[15]

Alchemical tradition recorded the names of Iamblichus, Moses, Ostanes, and Isis, practicing transmutation in the first and second centuries. The names are pseudonyms with the exception of Iamblichus,[16] and he is not identical with the better-known writer of the same name.[17] The nature of alchemical literature is well illustrated by the remnants of "Moses" and "Ostanes." The opening section of one of Moses' works is a garbled version of *Exodus* XXXI, 2-5, and the work is attributed to the Hebrew sage. It seems "Ostanes" was suggested by the Persian name of the teacher under whom Democritus supposedly studied.[18] Other writers before Zosimus of Panopolis (*fl. c.* A.D. 300) include Maria "the Jewess," Cleopatra, "Hermes," and "Agathodaemon."[19] Zosimus believed in the authenticity of Maria and Cleopatra's works, and he records enough of their purported material to give us a fair indication of alchemy as it existed in the third and fourth centuries. Through Zosimus, we note that Maria was very practical in her approach to alchemy, and she supposedly invented most of the processes used by later alchemists.[20] For example, she originated an elaborate 'kerotakis' apparatus, a hot ash bath, a dung bed, and water bath, an apparatus for liquid distillation that remained standard in alchemy for 2000 years, and description of alloys of copper and lead.[21] Cleopatra bequeathed to Zosimus materials

that were less 'practical,' but nonetheless influential. Her *Chrysopoeia* survives only as a page of symbols and drawings which include the serpent Ouroboros (devouring his own tail), a sketchy distillation apparatus, and the 'kerotakis' apparatus for metal fixing.[22] Mystical writing is further infused into alchemy with "Hermes," probably not related to the mystical works under "Hermes Trismegistus," but are from priestly works of "Hermes-Thoth."[23] "Agathodaemon" completes the trend toward Gnostic thought within alchemy, and the remnants of his materials suggest contemporary Gnostic hymns.[24]

Throughout all this literature, there are definite links to drug lore, particularly when the pre-Zosimus writers treat substances like alum, natron, ochre, honey, gum, milk, bile, urine, and numerous vegetable products, already well-delineated in Dioscorides and Galen.[25] The tone of fairly rational approaches to metals, alloys, and drugs, noted for Pseudo-Democritus, has passed into something different—a kind of reverence for the mysterious and poetic essence that will appear to selected mortals who then will taste divine beauty and know the way of Truth.[26] Gnosticism taught inner worlds and alchemy was imbued with esoteric meaning and expression, as opposed to exoteric action, by the beginnings of the fourth century. Zosimus did not contribute much that was original to alchemy,[27] but he created a masterful synthesis of alchemy and its current form, wrapped as it was in the sparkling ribbons of Gnosticism, Stoicism, and drug lore.

The first reliable documentation for Graeco-Roman alchemy occurs with Zosimus' writings, which are produced in the developed matrix of Gnosticism as it was taught in fourth-century Egypt.[28] Zosimus composed an alchemical encyclopedia (the *Cheirokmeta*) which has reached us in Greek and Syriac segments.[29] Gnostic argument permeates Zosimus' writing as he offers the alchemical "Way of Understanding" in contrast to other ways, particularly astrology and magic.[30] Typical of the diffuse obscurity in alchemy by Zosimus' day is his *On Divine Water*.[31] From the text, it is impossible to determine anything about the nature of the 'divine water,' which seems to have the power to dissolve or disintegrate substances used by alchemists, and it had the power to color metals. Perhaps it was also volatile and gave a vapor that attacked metals, and sometimes mercury or solutions of hydrolized sulfides are meant by 'divine water.'[32] Plant juices have the property of tinting metals, according to another treatise by Pseudo-Democritus,[33] and many of the terms, clearly given by the earlier author, now become mystical and all-encompassing.[34]

Hidden among the various mysterious allusions to the power of transmutations and their formulas —known and comprehended only by the initiated—are disguised recipes which represent a tradition of pharmacology separate from better-known Byzantine or Arab drug lists.[35] In later Byzantine medicine and pharmacology, the study of drugs in their own right was unknown. The doctor acted as his own druggist, and physicians followed the tradition of Galen, who

sought far and wide for good healing agents that ranged from plants to ores.[36] Medical writers in the Byzantine tradition as Oribasius, Aetius, Paul of Aegina, and Theophanes Nonnus, drew up lists of remedies which listed those drugs manufactured professionally as well as those classed as household remedies.[37] This tradition is historically connected with origins in Greek and Roman medicine, but the fusing of drug lists with alchemical symbolism wends an extremely complicated path until it emerges for a short time in the alchemy and drugs of al-Razes, and then, much later, in the iatrochemistry and alchemy of the Renaissance.[38]

Much as Gnosticism failed to gain many adherants after the fourth century, so the amalgam of alchemy, Gnosticism, and drug lore did not influence many thinkers outside the esoteric circles of initiated alchemists. Zosimus borrows heavily from earlier drug lists as do his predecessors, to suffuse something of the properties of drugs and *their* changes into general concepts of alchemy. Pharmacological recipes had a minor, but important place, in how alchemists conceived of the mysterious properties of ores and calcination, but the healing qualities of given remedies were submerged in a plethora of generalizing formulae which set forth the hope of making the "base into perfection." Later Byzantine commentators noted half-hidden connections, but they seemed to have missed the importance of earlier analogies that gave drugs properties usually reserved for 'minerals' and the like.

In sum, the alchemical-drug tradition, which took its origins in Roman Egypt, did not exert great influence except in a guarded manner and even that tendency became more and more obscured under the layers of mystical confusion. Under the impact of Gnosticism, alchemy adopted a changed direction, away from a technical craft, best seen in Pseudo-Democritus, and directed its efforts into the foggy channels of the quest for the Philosopher's Stone. Any advances promised in the early history of alchemy toward technical understanding of the chemistry of mineral compounds, drugs made from earth matter, and the basic metals, was effectively thwarted by the questions alchemists asked after Zosimus. They came in the form of "how do we go from the base to the perfect in nature," and such tendencies smothered development above the level achieved by Maria. On the other hand, alchemy *did* perfect a number of processes by which certain metals could be made to resemble other metals, but since such changes did not always last, alchemists continued to seek better combinations and secrets. The partial success blinded them to other approaches which waited until the nineteenth and twentieth centuries to be exploited.

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18. Diogenes Laertius, I, 2 (prologue) and IX, 7. 34-36.

19. Maria: Berthelot, *Collection*, III, 103 (assertion of Maria's Jewish background). Maria's works survive only in quotations by Zosimus and other alchemical authorities. Berthelot, *Collection*, III, 90-106, 148-152, 169-176, 192-198, 355-357. Cleopatra: Berthelot, *Collection*, I, 132 (diagrams without text from her *Chrysopoeia*, III, 290 (included with "Comarius"). Hermes: Berthelot, *Collection*, III, 23, 115, 267-268. Other fragments appear in Zosimus and later alchemical commentators. Agathodaemon: Berthelot, *Collection*, III, 115, 268-271.
20. The traditional alchemical apparatus remained unchanged from this time. See A. J. Hopkins, *Alchemy: Child of Greek Philosophy* (rptd., New York, 1967); O. Temkin, "Medicine and Graeco-Arabic Alchemy," *Bulletin of the History of Medicine*, XXIX (1955), 134-155; and the general suggestions in E. J. Holmyard, "Alchemical Equipment," in C. Singer, *et. al.* eds., *A History of Technology* (Oxford, 1956), II, 731-752.
21. Berthelot, *Collection*, III, 90-106, 148-152, 169-176, 192-198. Taylor, *Journal of Hellenic Studies*, L (1930), 116.
22. Berthelot, *Collection*, I, 132.
23. Taylor, *Journal of Hellenic Studies*, L (1930), 117.
24. Berthelot, *Collection*, III, 115, 268-271. R. Reitzenstein, *Poimandres: Studien zur griechischen-ägyptischen und früh-christlichen Literatur* (Leipzig, 1904), 143, 165-170. J. Kroll, *Die Lehren des Hermes Trismegistos* (Munster, 1914), 90.
25. See the general suggestions that Zosimus may have borrowed more from Galen than is usually noticed, in M. Berthelot, "Sur les voyages de Galien . . . .," *Journal des Savants* (1895), 382-387 (full citation of article in note 9 above). The various lists of materials that alchemists considered useful in their work (*e.g.* Berthelot, *Collection*, III, 4-17) contain many references to pharmaceutical matter. Throughout the Greek texts, particularly those of later "commentaries" that were written in Byzantine times, are scattered, crabbed references to drugs known to Roman physicians. A few references will suffice here. Dioscorides (ed. Wellmann), II, 82: on Attic honey, followed in Berthelot, *Collection*, III, 11; Galen (ed. Kühn), XII, 168-178: on Galen's trips to Lemnos and Cyprus to procure a kind of reddish clay stamped into pellets (an iron oxide which Galen used for curing lethal poisons and bites of mad dogs), followed by Zosimus as quoted by Berthelot in *Journal des Savants* (1895), 382-387; Dioscorides, II, 70 (similar to Rufus of Ephesus (ed. Daremberg-Ruelle), 314, 486, 491, 543, and Galen, XII, 263-269): on milk, followed by Berthelot, *Collection*, III, 67 ("Synesius" who gives 'milk' mystical meanings; the text seems to be derived from Dioscorides or Rufus and Galen); Dioscorides, V, 106: on alum, followed in Berthelot, *Collection*, III, 171-174 ('alum' becomes something in between cinnabar and arsenic sulfide, with mystical language attached); the numerous references in Galen to the various "biles" (*vid.* Galen, IX, 460, XII, 276, XVII, 2, 271, among many: black bile, yellow bile, red bile) have become adapted into alchemical terms in Berthelot, *Collection*, III, 196(Zosimus), where 'shades' of metallic 'yellow' are emphasized with the 'bile' analogy. Taylor, *Journal of Hellenic Studies*, L (1930), 123-124. The alchemists heavily plagiarised Dioscorides, V, 74 sq. ("Metallic Stones"), which included descriptions of *kadmeia* ('calamine'), *chalkos kekumenos* ('burned copper'), *molubdos kekaumenos* ('burned lead'), *psimuthios* ('white lead') and many more that we meet in the alchemical literature.
26. Berthelot, *Collection*, III, 228-246. Here Zosimus narrates the confused connections between the Jewish, Christian, and Egyptian religious traditions and how they contribute directly to the mystical art of alchemy. *Collection*, III, 239-241, contains some important passages where Zosimus links Egyptian "gnosis" with the Way of Truth. The context suggests the setting of general Egyptian Gnosticism, both Christian and non-Christian.
27. Lindsay, *Origins of Alchemy*, 323-357. Taylor, *Journal of Hellenic Studies*, L (1930), 119-120.
28. Zosimus, "Final Summary," (Berthelot, *Collection*, III, 239-246.).
29. Lindsay, *Origins of Alchemy*, 323, 428 (reffs.).
30. Zosimus, "Final Summary." L. Thorndike, *History of Magic and Experimental Science* (New York, 1923), I, 129-132. Contrast A. Bouché-Leclercq, *L'astrologie grecque* (Paris, 1899; rptd. Brussels, 1963), 517-542, with Zosimus' remarks.
31. Zosimus, "On Divine Water" (Berthelot, *Collection*, III, 184-186).
32. Taylor, *Journal of Hellenic Studies*, L (1930), 131.

33. Zosimus, "Substances Amalgamating Tinctures" (Berthelot, *Collection,* III, 150-151.

34. There seems to be confusion whether "Agathadaemon" or "Democritus" wrote down the ideas, according to Zosimus.

35. Within Berthelot's *Collection,* there are fragments of some of these commentators. Philosophus Christianus (early sixth century), Stephanus (c. 610-641), Philosophus Anonymus (seventh or eighth century), Michael Psellus (1018-1078), Cosmas (c. 1000), and Nicephoras Blemmydes (thirteenth century) are representative names in the list (*vid.* Taylor, *Journal of Hellenic Studies,* I (1930), 121-123, for summary of contents).

36. J. Scarborough, *Roman Medicine* (London and Ithaca, New York, 1969), 128-130, 139-140.

37. L. Oeconomos, "Le calendrier de régime d'Hierophile d'après des manuscrits plus complets que le Parisinus 396", *Actes du VIe Congrès international d'études byzantin* (Paris, 1948), I (1950), 169-179. J. Hussey, ed., *The Cambridge Medieval History,* Vol. IV, part II: *The Byzantine Empire: Government, Church and Civilisation* (Cambridge, 1967), 293-294.

38. S. H. Nasr, *Science and Civilization in Islam* (Harvard, 1968), 242-292. H. Lauer, "Elemente und Kräfte im Naturverständnis des Paracelsus," *Antaios,* XI (1969), 321-334. W. Pagel and M. Winder, "The Eightness of Adam and Related Gnostic Ideas in the Paracelsian Corpus," *Ambix,* XVI (1969), 119-139.

INVITATION

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SPECIAL BIBLIOGRAPHIES IN THE HISTORY OF PHARMACY - I: Texts and Sources in Ancient Pharmacy
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find himself facing a demanding scientific challenge," contend Roy A. Bowers and David L. Cowen in their concise history of continuing education in pharmacy at Rutgers. (*Rutgers Pharmacy Newsletter*, Fall 1986, 1, 6.) Rutgers was the first American college of pharmacy to set up a full-time pharmacy extension service in 1950.—G.H.

SPECIAL BIBLIOGRAPHIES IN THE HISTORY OF PHARMACY—I

The Institute encourages scholars to submit bibliographic essays for this occasional section of In the Literature.

Texts and Sources in Ancient Pharmacy

by John Scarborough

After a lengthy hiatus, there is a revival of interest among classical scholars and historians of pharmacy and medicine in the particulars of ancient drug lore. Recent listings of published studies in the Society for Ancient Medicine and Pharmacy *Newsletter* suggest an ever-increasing probing of the sources and texts of ancient Near Eastern, Greek, Roman, and early Byzantine pharmacy, and a major component of these studies is an attempt to identify various species of medicinal products, ranging from the expected herbal preparations to animal products and pharmaceutically active minerals. Many scholars are now exercising commendable care as they suggest modern nomenclatures and interpretations of properties through physiological biochemistry, a care that is coupled with clear admonitions that antiquity always had its own manner of "understanding" the properties of medicinally active drugs. The work of John M. Riddle, Ann Hanson, Vivian Nutton, Klaus-Dietrich Fischer, Jerry Stannard, Michael Harstad, Emilie Savage-Smith, Jacques André, M.-H. Marganne, and several other scholars representing the international character of ancient medical studies, has begun to explicate important specifics of ancient pharmacy, and there is certain to be an increased interest in the subject by graduate students in Classics, History of Medicine, History of Pharmacy, History of Science, and ancient history generally. Since there exists no annotated listing of the primary texts (mostly Greek and Latin) of ancient pharmacy, the following is presented as an aid and guide to further research.

It must be remembered that drug lore functioned as an integral portion of ancient medicine as a whole, and that the practice of medicine—however defined—almost always included knowledge of beneficial and harmful *pharmaka*, much as indicated in Homer's *Iliad* and *Odyssey*, the earliest documents reflecting an emerging Greek civilization in the seventh century B.C. Modern "pharmacy" as such did not exist, and the physician counted his command of drug lore as one of the most important tools of his (or her) trade. Even when one finds tracts devoted particularly to drugs in classical antiquity (e.g. by Dioscorides or Scribonius Largus), the authors are first and foremost physicians seeking to describe pharmaceuticals; the best of them also attempt to bring some order into a usually chaotic drug lore, and Theophrastus' hopes of classifying herbs through the methods of folk medicine was supplanted by Dioscorides' "drug affinity" system or by long alphabetical lists of plants and drugs as seen in the pages of Galen and Paul of Aegina. Except for Theophrastus, certain writers among the Hippocratic physicians, Galen, and the early Byzantine physicians, concepts of a "drug theory" do not loom large, so that the modern scholar is occasionally forced to make assumptions from current philosophical notions in antiquity or presumptions "taken for granted" in the texts of folkloristic drug lore, exemplified by Theophrastus' oral

sources, the *rhizotomoi* ("rootcutters"), or by the traditions of old Egypt which dominate the Greek and Coptic texts of the *Papyri Graecae Magicae*.

Ancient Near Eastern Drug Lore

Few published texts of the cuneiform tracts on medicine and pharmacy have appeared, but those that one can employ suggest the venerability of certain plants employed as drugs, from frankincense and myrrh to henna and saffron. Drugs of occasionally uncertain identity are common in Akkadian medical texts, nicely summarized in transliterated texts and French translations by René Labat, *Traité Akkadien de diagnostics et pronostics médicaux* (Paris and Leiden, 1951; 2 vols.), and should one wish to tackle some of the cuneiform texts themselves (in Assyrian), one can puzzle through the published texts in R. Campbell Thompson, *Assyrian Medical Texts from Originals in the British Museum* (London, 1923; rptd. New York, [?] 1977). Thompson publishes the Assyrian cuneiform texts without commentary or translation, but his "Preface" lists scholarly effort which had gone into the cuneiform medical works before 1922. Labat's plentiful bibliographic citations will also lead into more recent studies. J. V. Kinnier Wilson, *The Nimrud Wine Lists* (London, 1972), 74–76, suggests other cuneiform texts which have been published in limited numbers in scattered specialist journals.

Compared to the dearth of published sources of ancient Mesopotamian medicine and pharmacy, there is much a student can analyze in similar texts from ancient Egypt. Most famous is the Edwin Smith Papyrus, generally devoted to surgical techniques, but which contains many pharmaceuticals as parts of treatments. Dated to about 1800 B.C., this text is in Hieratic, an abbreviated form of Hieroglyphic, and it was published in a fully restored Hieroglyphic text with translation and commentary by James Henry Breasted, *The Edwin Smith Surgical Papyrus* (Chicago, 1930; 2 vols.). A primary document for ancient Egyptian drug lore is the Ebers Papyrus, first rendered into German by H. Joachim as *Papyrus Ebers* (Berlin, 1890), but a vastly improved translation appeared in English by B. Ebbell as *The Papyrus Ebers, the Greatest Egyptian Medical Document* (Copenhagen, 1937). Dated to about 1300 B.C., the Ebers Papyrus is stuffed with plants and animal products employed as drugs, and the prominence of myrrh, frankincense, saffron, iron oxides, ox bile, crushed wasps, and hundreds of other pharmaceuticals indicates a very sophisticated (and very poorly understood) medicinal pharmacy among Egyptian physicians in the eighteenth Dynasty. Unhappily, the commonly-cited Cyril P. Bryan, trans., *Ancient Egyptian Medicine: The Papyrus Ebers* (London, 1930; rptd. Chicago, 1974) is a very badly translated English text from the poor translation in German by Joachim, so that the would-be student of ancient Egyptian pharmacology is best served by avoiding the Bryan translation. Most valuable, however, among modern editions and translations of Egyptian medicine as a whole are the various volumes of Hermann Grapow, *et al., Grundriss der Medizin der alten Ägypter* (Berlin [East], 1954–1973; 9 vols. in 11 parts). All major texts are published in Hieroglyphic in Vol. 5, Herman Grapow, *Die medizinischen Texte in hieroglyphischer Umschreibung* (Berlin, 1958), and one may locate particular pharmaceuticals as transliterated and cross-indexed to the various papyri in Vol. VI, Hildegard von Deines and Hermann Grapow, *Wörterbuch der ägyptischen Drogennamen* (Berlin, 1959). Vol. IX is *Ergänzungen* by Hildegard von Deines, Hermann Grapow, and Wolfhart Westendorf (Berlin, 1973), and incorporates the very useful "Die Drogenquanten," again cross-indexed to particular papyri. A German translation of all the medical texts is in Vol. IV, part 1, *Übersetzung der medizinischen Texte*, as rendered by von Deines, Grapow, and Westendorf (Berlin, 1958). The editors' methods of subdividing the papyri according to "classes" of illnesses and treatments may prove confusing initially, but with the careful cross-indexing system, a student can quickly learn to refer back and forth among the several volumes involved in this massive and scholarly encyclopedia of Egyptian medicine and drug lore. Coptic nomenclatures for plants often prove decisive in identifying ancient Egyptian herbal preparations, and one may profitably consult Walter C. Till, *Die Arzneikunde der Kopten* (Berlin [East], 1951) on this aspect of Egyptian botany. Less medical but still very helpful for special plants employed in Egyptian drugs is Renate Germer, *Flora des pharaonischen Ägypten* (Mainz am Rhein, 1985). Succinct surveys of some of the drug lore of ancient Egypt, as well as listings of secondary works in French, German, English, and Italian, are in

Paul Ghalioungui, *The House of Life, Per Ankh. Magic and Medical Science in Ancient Egypt*, 2nd ed. (Amsterdam, 1973 [esp. ch. 10: "Materia medica and dispensing"]) and *idem. The Physicians of Pharaonic Egypt* (Mainz am Rhein, 1983).

Strangely understudied by historians of pharmacy is the rich trove of data extant from the deep traditions of the ancient Hebrews, best observed in references to drugs contained in the Old Testament. The vast compilation of rabbinical discussion and comment as incorporated into the Talmud (embodying the Mishnah, the oral teaching of the Jews, and the Gemara, the collections of discussions on the Mishnah) is replete with specific pharmaceuticals, only superficially quarried by Wilhelm Ebstein, *Medizin im neuen Testament und im Talmud* (Stuttgart, 1903; rptd. Munich, 1975), 169–191 ("Heilmittel") and Julius Preuss, *Biblical and Talmudic Medicine*, trans. by Fred Rosner (New York, 1978; original German text published 1911), 443–447 ("Materia Medica"). Preuss does include a number of recipes incidentally in his descriptions of various diseases (e.g. "Diseases of the Eyes," 259–284, and "Skin Diseases," 323–374), but the resources of the Talmud and Mishnah remain to be explicated in terms of drugs and drug lore among the ancient Hebrews. Good translations into English are available of both the Talmud and Mishnah: I. Epstein, ed., *The Babylonian Talmud* (London, 1935–1952; 35 vols.), and Herbert Danby, trans., *The Mishnah* (Oxford, 1933; last rptd. 1980). Cross-linguistic equivalencies quite often reveal a living drug lore, as practiced in antiquity, and the Greek translation of the Hebrew religious texts by a traditional committee of 70 scholars in Hellenistic Alexandria is a valuable text suggesting how Hebrew (and probably Aramaic) plant names were rendered into the Greek of the third or second centuries B.C. Commonly known as the Septuagint, this Greek translation of the Hebrew 'Old Testament' is available in several well-edited texts and English translations, the most widely employed remaining that by L. C. L. Brenton, ed. and trans., *The Septuagint with Apocrypha* (London, 1851; last rptd. 1980). Two older, brilliant "dictionaries" of plant names will provide many of the exact references into Talmudic and related texts: Immanuel Löw, *Aramaeische Pflanzennamen* (Leipzig, 1881) and *idem. Die Flora der Juden* (Vienna, 1924–1934; 4 vols.). The scholarly tools are in place, the texts in Hebrew, Greek, Aramaic, and occasionally Syriac are generally in reasonable well-edited and published form, and yet there is no comprehensive study of ancient Hebrew pharmacology. This is certainly a desideratum to be accomplished by a future historian of ancient medicine and pharmacy.

Greek Pharmaceutical Lore

Although there is some evidence to suggest that earlier Mycenaean practices in spice lore and possibly pharmacology survived into Greek medical thinking (for which *vid.* Cynthia Wright Shelmerdine, *The Perfume Industry of Mycenaean Pylos* [Göteborg, 1985]), Greek civilization and culture had its own peculiar manner of asking questions about the world of nature and how man fit into that world. Homer's *Iliad* and *Odyssey* (an oral form of these epics was probably standardized by about 800 B.C.) signal these approaches with several mentions of drugs in their varied forms—from the "good" *pharmakon* to bad *pharmakon*, with this famous Greek word encompassing a full range of meanings from "magical spell" to "poison" to "beneficial remedy." The presence of itinerant healers in Homer's world of Greek Asia Minor in the seventh century B.C. (they are termed *dēmiourgoi*) suggests a continual infusion of magic and magicians into early Greek botany, agriculture, and medical pharmacology (for which *vid.* Walter Burkert, *Die orientalisierende Epoche in der griechischen Religion und Literatur* [Heidelberg, 1984]), as well as how continual debate characterized Greek concepts of "drug actions" on the several simultaneous levels of empirical observations and conclusions, religious custom, and pure magic and amuletic lore (for which *vid.* John Scarborough, "The Pharmacology of Sacred Roots, Plants and Herbs," in C. Faraone and D. Obbink, eds., *Accessing the Divine: Studies in Greek Magic and Religion* [Oxford, 1988 (in press)]). Scattered references of herbal plants and drugs occur (after Homer) in Hesiod's *Works and Days* (of about 700 B.C.), the Lyric Poets (Sappho, as an example), and in the poems of Pindar (518–438 B.C.) among many Greek sources. Athenian playwrights could assume the audiences of the tragedies and comedies staged in honor of Dionysus would know the names of common herbs, so that Aristophanes in the *Lysistrata* (411 B.C.) could make puns on the uses of European pennyroyal and Sophocles' *Rhizo-*

tomoi (Rootcutters) of about 441 B. C. could presume "everyone would know" the status and practices of these semi-professional herb-gatherers. Yet drugs remained simply an integrated aspect of medicine, without too much specialized comment, until the era of Aristotle (384–322 B.C.).

The first quasi-systematic survey of medicinals seems to have been made by Diocles of Carystos, a contemporary of Aristotle. Diocles combines medical botany with etiology, dietetics, and prognostics in medicine, and his work would repay serious attention. Enough has survived of his writing on pharmacology and dietetics to indicate the close relationship of botanical remedies with both medical practice and earlier philosophic theories as they filtered down into the fourth century B.C. A printed text of the Greek fragmentary remnants of Diocles' works was published by Max Wellmann, ed., *Die Fragmente der sikelischen Ärzte Akron, Philistion und des Diokles von Karystos* (Berlin, 1901), 117–207 [193 fairly extensive texts, quite frequently replete with pharmaceutical lore]. Slightly earlier than Diocles was Mnesitheus of Athens, who wrote extensively on medical dietetics and drugs, and Mnesitheus' works were frequently quoted in later medical compilations. What is left of Mnesitheus can be perused in the Greek texts, edited with French translations in Janine Bertier, ed., *Mnésithée et Dieuchés* (Leiden, 1972).

AMONG the students of Aristotle, Theophrastus of Eresus (about 370 to about 285 B.C.) has left his mark as the most brilliant of his master's successors in the Peripatetic School of philosophy. Theophrastus is noted for his *Inquiry into Plants*, the last book (Book IX) of which is the first complete herbal treatise to survive in Greek (for which *vid.* John Scarborough, "Theophrastus on Herbals and Herbal Remedies," *Journal of the History of Biology*, 11 [1978], 353–385). An incomplete Greek text and English translation is available in Arthur Hort, ed. and trans., *Theophrastus: Inquiry into Plants and Minor Works on Odours and Weather Signs* (London, 1916; 2 vols [Book IX: Vol. II, 217–321]). Victorian prudery caused Hort to omit some rather mild passages on aphrodisiacs and sexual suppressants as found in Theophrastus, *Inquiry*, IX, 18. 3–11, so that one must employ the Greek text of these sections, last edited by F. Wimmer, *Theophrasti Eresii opera* (Paris, 1866; rptd. Frankfurt am Main, 1964), 160–161 [with Latin translation]. An English translation (without commentary) has been rendered of these omitted sections of Theophrastus, *Inquiry*, IX, 18. 3–11: Chalmers L. Gemmill, "The Missing Passage in Hort's Translation of Theophrastus," *Bulletin of the New York Academy of Medicine*, 49 (1973), 127–129. Theophrastus' herbal botany was derived generally from oral sources, especially the semi-professional classes of *rhizotomoi* ("root cutters") and *pharmacopōlai* ("drug vendors") who hawked their wares at country festivals and city celebrations in fourth century B.C. Greece. It is from these folkmedical experts that Theophrastus derives a rather wobbly definition of "herb" as contrasted to an ordinary plant.

Drug lore appears only occasionally in the large number of writings under the name of Hippocrates (Hippocrates of Cos, *fl.* about 425 B.C.), and the most complete collection of Greek texts (with French translations) of the writings in the Hippocratic *corpus* remains E. Littré, ed., *Oeuvres complétes d'Hippocrate* (Paris, 1839–1861; 10 vols.; rptd. Amsterdam, 1973–1982 [a second reprinting]). Drugs do appear in certain of the Hippocratic treatises, e.g. the *Diseases III*, last edited (with German translation) by Paul Potter, *Hippokrates: Über die Krankheiten III* (Berlin [East], 1980 [*Corpus Medicorum Graecorum* I 2,3]), but the greatest concentration of drugs in the Hippocratic *corpus* occurs in the obstetrical and gynecological tracts, the *Diseases of Women*, *Diseases of Young Girls*, and *Nature of the Child* (ed. Littré, Vol. VIII, 10–233, and 466–473; and Vol. VII, 486–540). Perhaps one is reading the "data" of midwives and prostitutes, incorporated into the pharmaceutical lore of the anonymous authors of *Diseases of Women*, *Diseases of Young Girls*, and *Nature of the Child*, but until the publication of the re-edited Greek text and English translation of *Diseases of Women* by Ann Hanson (forthcoming in the *Corpus Medicorum Graecorum* series), one will have to wait for the latest scholarly judgment on the matter. It would appear, however, that much of the concept of "how drugs work" in the Hippocratic *corpus* derives from Aristotelian theory, for which *vid.* John Scarborough, "Theoretical Assumptions in Hippocratic Pharmacology," in F. Lasserre and P. Mudry, eds., *Formes de Penseés dans la collection hippocratique* (Geneva, 1983), 307–325.

[to be continued]

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would it support its own periodical? Undaunted, Lyman turned his attention more to questions of editorial content. With the help of a few influential members within the Association, such as Secretary-Treasurer Zada Cooper, Lyman succeeded in starting the Journal. Named as Editor, he made the Journal a reflection of his own strongly held opinions. (Moreover, Editor Lyman provided an important outlet for scholarly papers on the history of pharmacy.)

Sonnedecker's history of the founding of the AJPE is based primarily on the personal papers of Rufus Lyman, which are preserved in the Collections of the American Institute of the History of Pharmacy at the State History Society of Wisconsin. These collections also house the papers of other important figures in American pharmacy, such as Donald E. Francke, Frederick and J. Leon Lascoff, and Robert P. Fischelis.—G.H.

SPECIAL BIBLIOGRAPHIES IN THE HISTORY OF PHARMACY—I

The Institute encourages scholars to submit bibliographic essays for this occasional section of In the Literature.

Texts and Sources in Ancient Pharmacy (continued)*

by John Scarborough

Hellenistic Pharmacy, Toxicology, and Medical Entomology

A crucial watershed in Greek history was the remarkable career of Alexander the Great (King of the Macedonians, 338–323 B.C.), one of the greatest military geniuses of all time. Forcibly uniting the fractious Greek states under Macedonian rule, Alexander took his Greco-Macedonian army on an amazing campaign of conquest of the Persian Empire (which included most of Asia Minor, Syria, Egypt, Mesopotamia, portions of south-central Asia, and sections of western India), reaching the headwaters of the Indus River in 327 B.C. After winning against an Indian army, equipped with a cavalry of elephants in 326 B.C., Alexander and his exhausted troops retired to Bablyon, where the youthful general died in 323 B.C., leaving his enormous empire "to the strongest," according to Arrian, the best of the numerous 'Alexander-historians' of classical antiquity. The new conquests became 'Greek-like' states, and students of ancient history customarily designate Greek history before Alexander as "Hellenic," with the three centuries between the death of Alexander and the death of the last 'Greek' monarch of Egypt (Cleopatra VII in 30 B.C.) termed "Hellenistic," to indicate the striking contrasts between the cultural life of the narrowly constricted Greek states before Alexander's career, and the broadly based Hellenistic kingdoms of the Near East which exhibited a patina of Hellenic speech and customs, 'Greek-like' only in surface manifestations.

Yet in this historical and cultural context of Greek-speaking rulers in their small numbers dominating the millions of Egypt, Syria, and other areas of the Near East, there were erected lasting urban centers, resplendent in their Greek manners and cultural customs, from exercise grounds to centers of worship of the Greek gods of old. Greek became *the* language of commerce and learning throughout the vast sweep of territory from Macedon to India, and the new elites from the Greek homelands brought into Egypt, Syria, Mesoptamia, and even Bactria and India, the peculiar approaches of Greek philosophy, art, politics, literature, and science, now transplanted in the multinational and polylingual cities of Alexandria of Egypt, Antioch of Syria, Pergamon in western Asia Minor, and dozens

*Continued from *Pharmacy in History* 29 (1987):81-84.

of other Alexandrias rooted along the road of conquest to India. In Alexandria of Egypt, especially, the multifaceted culture called "Hellenistic" produced some of the greatest achievements of Greek science, and the Alexandrian Museum with its flanking libraries became legendary.

The heritage of Aristotle loomed large in several aspects of Hellenistic science and the medical arts, including pharmaceutical lore. Sometime around 250 B.C., a polymath named Apollodorus put down data on poisonous creatures, employing the time-tested methodologies of the Peripatetic School to classify snakes, scorpions, spiders, certain insects and similar animals deemed dangerous through their bites and stings. Apollodorus' *Poisonous Animals* has not survived, but this tract became enormously influential on later Greek and Roman efforts to comprehend pharmacological toxicology, with Apollodorus quoted by almost all writers on the topic from his own day until later Byzantine times. The few identifiable fragments of Appolodorus' work form part of the commentary and analysis by Otto Schneider, "Apollodorus' Iologorum Dux" in *Nicandrea* (Leipzig, 1856), 181–201, and there is evidence that Apollodorus also composed a treatise *On Poisons (Peri dēlētēriōn pharmakoñ).* For the complex textual history of Apollodorus' writings as used by other Hellenistic and early Roman imperial authors, one may still find value in Max Wellman, "[Apollodoros, der Iologe]" in Franz Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit* (Leipzig, 1891–1892; 2 vols.), Vol. I, 784–785.

Poetic Sources

The impact of Apollodorus on Hellenistic toxicology is particularly evidenced in two extant, hexameter poems, the *Theriaca* and *Alexipharmaca* by Nicander of Colophon (*fl. c.* 140 B.C.). Deliberately modeled on the Homeric *Iliad* and *Odyssey*, Nicander's poems compact much of the data on medical entomology and toxicology gathered by Apollodorus a century earlier, and these poems show the incompetence of the poet while he purloins the accurate facts on cobras and centipedes, black widows and blister beetles, and many other creatures from the pages of Apollodorus. Nicander's *Theriaca* and *Alexipharmaca* have been re-edited and translated into English by A. S. F. Gow and A. F. Scholfield, *Nicander: The Poems and Poetical Fragments* (Cambridge, 1953), and one will find tentative suggestions regarding nomenclatures of plants and animals which embellish the Greek hexameters. Nicander also gives a fairly complete synopsis of known remedies for snake bites, scorpion stings, and antidotes for ingested poisons (for which *vid.* John Scarborough, "Nicander' s Toxicology, I: Snakes," and "Nicander's Toxicology, II: Spiders, Scorpions, Insects and Myriapods," *Pharmacy in History*, 19[1977], 3–23, and 21[1979], 3–24 and 73–92). Casting the facts of medical entomology and toxicology into hexameter lines of poetry may strike the modern pharmacist as rather odd, but this particular format enabled easy memorization, which may explain why Nicander's often obtuse poems became the "textbooks" on the subject from his own day through the early decades of the European Renaissance. Of course, even Greek and Roman readers were often puzzled by Nicander's terminologies, so that an extensive literature of commentaries on Nicander soon became part of the textual history of the *Theriaca* and *Alexipharmaca.* Marginal comments and suggestions in recopied manuscripts (that is what are called "scholia") of Nicander's works have come down to us in company with the actual poems, and these scholia have been published in freshly edited texts in their own right. Occasionally, the ancients were wildly guessing at obscure meanings in Nicander, but quite frequently the anonymous authors of the scholia have left us quotations of lost authorities, as well as lexical definitions which *do* clarify Nicander's often opaque coinages, so that consultation of the scholia becomes essential to comprehend Hellenistic toxicology and pharmacology as a whole. Published texts of the scholia to Nicander include Marius Geymonat, ed., *Scholia in Nicandri Alexipharmaca* (Milan, 1974), and Annunciata Crugnola, ed., *Scholia in Nicandri Theriaka* (Milan, 1971), but one may also employ the F. Dübner, ed., "Scholia" in *Scholia in Theocriti Idyllia* (Paris, 1878), 173–219. From time to time, Greek and Roman savants attempted "prose-paraphrases" of Nicander, and there is extant one such prose summary by an otherwise unknown Eutecnius (*fl.* before A.D. 512), whose Greek text has recently

This shallow Greek bowl, from about the 6th century B.C., shows the weighing, packing, and stowing of drugs, probably silphium. The bowl is now in the Cabinet des médailles, Bibliothèque Nationale, Paris.

appeared in two, freshly-edited and published editions: Isabella Gualandri, ed., *Eutecnii Paraphrasis in Nicandri Theriaca* (Milan, 1969), and M. Papathōmopoulos, ed., *Eutekniou Paraphraseis eis ta Nikandrou Thēriaka kai Alexipharmaka* (Iōannina [Greece], 1976 [with introduction in Modern Greek]). Eutecnius' prose versions show rather vividly the quandaries faced by ancient physicians and toxicologists, as they sought to untangle the "made up" terms of Nicander from the underlying data faithfully recorded by Apollodorus and other medical practitioners and pharmacologists of the Hellenistic era.

Another Hellenistic poet who has left us with glimpses of an active practice of medicine and knowledge of drugs is the famous Theocritus of Syracuse (*c.* 300–*c.*[?] 260 B.C.), best known for his *Idylls*, probably composed while the poet was resident in Alexandria. *Idyll* II bears the title *Pharmakeutria*, and is a revealing collection of folkmedicine and magical *pharmaka*, directed and applied for the specific purposes of sexual passions. An excellent Greek text, with fluid English translation and exhaustive commentary, comprises A. S. F. Gow, ed. and trans., *Theocritus* (Cambridge, 1952; 2 vols.). Like Nicander's lines, Theocritus' poems engendered an extensive ancient collection of marginal commentaries, so that one may also consult what Greek and Roman scribes thought Theocritus meant (obscure references, plant-identifications, and similar matters) in these scholia, best available in C. Wendel, ed., *Scholia in Theocritum vetera* (Leipzig, 1914; rptd. Stuttgart, 1967). Theocritus' botany, drug lore, and knowledge of medicine, have intrigued scholars for several centuries, with the most useful recent study by Kurt Lembach, *Die Pflanzen bei Theokrit* (Heidelberg, 1970); Lembach's bibliographical listings are a sure guide to the secondary literature on pharmacy, botany, medical magic, and folklore in Theocritus' poems.

Fragments

Much of what we know about Hellenistic physicians and pharmacologists emerges in lengthy quotations by later authorities (*e.g.* Galen of Pergamon [A.D. 129–after 210]), so that modern scholars are forced to piece together numerous fragments embedded as citations within extant writings in order to gain a notion of particular Hellenistic physicians' contributions, pharmaceutical expertise, and theoretical concepts. One knows, for example, about the fundamental research in anatomy and physiology by the renowned Herophilus and Erasistratus (both probably *fl. c.* 260 B.C.) at the Alexandrian Museum *only* through Galen's quotations of lost writings, or through similar citations in the Greek of Rufus of Ephesus (*fl.* in reign of Trajan [A.D. 98–117]), or in the Latin texts of Cornelius Celsus (*fl.* in reign of Tiberius [A.D. 14–37]), Caelius Aurelianus (*fl.* [?] A.D. 400), and several other medical authors of Roman imperial times. Collection of such 'frag-

ments' is often fraught with great difficulty, because later writers frequently cite several earlier authorities in a single block, and modern research on Hellenistic medicine and pharmacy must initially tease apart several 'quotations' jumbled together by later authorities.

Praxagoras of Cos (*fl. c.* 300 B.C.) was famous in classical antiquity as one of the greatest physicians, in company with Hippocrates. Ancient doxographies named Praxagoras as the teacher of Herophilus, and the study of drugs and their applications in various therapies was apparently quite prominent in Praxagoras' practice. His many works are lost, except for quotations, and these have been assembled and translated into English by Fritz Steckerl, *The Fragments of Praxagoras of Cos and his School* (Leiden, 1958); pharmacy figures heavily in the fragmentary remnants of Praxagoras' *Therapeutics* (Steckerl, 90–107). Fewer fragments are extant of Phylotimus (*fl.* [?] 280 B.C.) and Pleistonicus (*fl.* [?] *c.* 280 B.C.), but as students of Praxagoras both displayed interest and expertise in dietetics and pharmaceuticals, suggested by Phylotimus' tract, *On Food* (Frgs. Nos. 8–21 [Steckerl, 110–120]) and Pleistonicus' account of hellebore preparations (Frg. 6 [Steckerl, 125–126]). Diphilus of Siphnos (*fl. c.* 300 B.C.) was a widely respected expert on dietetics and drugs, but his lost writings (particularly *On Good and Bad Foods*) are quoted exclusively by Athenaeus of Naucratis in Egypt (*fl. c.* A.D. 200) in the long-winded and curious pot-pourri *Deipnosophistae* (something akin to *Learned Men at Dinner*), for which *vid.* John Scarborough, "Diphilus of Siphnos and Hellenistic Medical Dietetics," *Journal of the History of Medicine and Allied Sciences*, 25 (1970), 194–201. If our texts reflect the essential issues of Hellenistic medicine and pharmacy, it appears that there was a continual debate concerning what constituted a "drug" as contrasted to a "food."

An important summary of drugs and applications was composed by Evanor (*fl. c.* 300 B.C.) in a work titled *Therapeutika*, lost except for quoted passages in Galen, Caelius Aurelianus, Athenaeus, and the *Natural History* by Pliny the Elder (A.D. 23/24–79), for which *vid.* refs. in Wellmann in Susemihl, *Geschichte*, I, 783. It was, however, the famous "research" center at Alexandria, which consolidated much of the previously determined facts about therapies and physiological theory, as well as anatomy. Herophilus of Chalcedon is famed for his dissections and discoveries of human anatomical structures, but he also wrote extensively on drugs and dietetics (P. M. Fraser, *Ptolemaic Alexandria* [Oxford, 1972; 3 vols.], I, 353, and II, 518–521 [refs. and notes]), apparently to the point where he and his students never "... treated any illness without drugs" (Celsus, *De medicina*, V prooemium 1). No satisfactory collection of fragments of Herophilus' writings has been performed, although one may still employ C. F. H. Marx, *De Herophili celeberrimi medica vita, scriptis in medicina meritis* (Göttingen, 1840) with great profit, and the translated excerpts with commentary by J. F. Dobson, "Herophilus of Alexandria, "*Proceedings of the Royal Society of Medicine*, Sect. History, 18 (1925), 19–32, encompass the majority of important quotations. Herophilus' presumably younger colleague, Erasistratus, is best known for his work on human physiology and for his formulation of medical theory (for which *vid.* Leonard G. Wilson, "Erasistratus, Galen, and the *Pneuma*," *Bulletin of the History of Medicine*, 33 [1959], 293–314), but there is ample evidence that Erasistratus pursued the specifics of drug therapies and dietetics with a widely recognized influence, as explicated by Wesley D. Smith, "Erasistratus's Dietetic Medicine," *Bulletin of the History of Medicine*, 56 (1982), 398–409, and as suggested by the truncated Greek text in Robert Fuchs, "Eine neue Receptformel des Erasistratos," *Hermes*, 33 (1898), 342–344. As in the case of the fragments of Herophilus, no completely satisfactory assemblage of Erasistratus' remnants has been collected, but one may consult Robert Fuchs, *Erasistratea* (Berlin, 1892 [diss.]) and "De Erasistrato capita selecta," *Hermes*, 29 (1894), 171–203, for a reasonable summary of the main themes and problems. Many of the major fragments are translated by J. F. Dobson, "Erasistratus," *Proceedings of the Royal Society of Medicine*, Sect. History, 20 (1927), 825–832 [= Section of the History of Medicine, 21–28]. A lucid survey of the problems linked to assessment of the often jumbled fragments of Erasistratus is found in Markwart Michler, "Erasistratos," *Die hellenistiche Chirurgie*, Teil I: *Die alexandrinischen Chirurgen* (Wiesbaden, 1968), 93–94.

Buried among the hundreds of cited authorities in Galen, Pliny the Elder, Caelius Aurelianus, and several similar later writers in Greek and Latin, are names and occasional quotations of Hellenistic physicians and pharmacologists. Basic chronology for these individuals remains controversial, so that the dates suggested below are but "rough guesses," founded on the painstaking research of Wellmann, Michler, Fraser, and several other modern scholars. Philinus of Cos (*fl. c.* 250 B.C.) apparently wrote prolifically in both textual criticism on the works of Hippocrates and also on specific remedies for particular afflictions (*e.g.* a compound drug to treat labored breathing, a concoction including rue, iris, and cassia); the few extended fragments of Philinus' tracts have been expertly edited and published in Karl Deichgräber, ed., *Die griechische Empirikerschule*, 2nd ed. (Berlin, 1965), 163–164 [9 frgs., with Nos. 135–137 and 140–141 of special interest]. Serapion of Alexandria (*fl. c.* 225 B.C.) composed a *Therapeutikon* in three books, and one knows about Serapion mostly through quotations in the later Latin texts of Caelius Aurelianus (Deichgräber, *Empirikerschule*, 165–167 [9 frgs., Nos. 145–153]); Serapion was an early member of the new "Empirical School" of medicine, for which *vid.* Fraser, *Ptolemaic Alexandria*, I, 359–360, and II, 529–530 [notes and refs.; Fraser uses the spelling S*a*rapion]. Uniquely, we have a firm date for Andreas (of Carystos), personal physician to Ptolemy IV Philopator (King of Egypt, 221–203 B.C.); Andreas was murdered in 217 B.C., since he chanced to be where Ptolemy IV was supposed to be during an assassination attempt (Polybius, V, 81. 6). Andreas wrote several works on medicinal herbs and poisonous animals, quoted by Scholiasts on Nicander, Pliny the Elder, Galen, and others, for which *vid.* Wellmann in Susemihl, *Geschichte*, I, 817–818, and Fraser, *Alexandria*, II, 528 (sources and refs.). Another royal physician who left his mark on Hellenistic pharmacology and toxicology was Apollophanes of Seleucia, chief physician to Antiochus III (King of Seleucid Syria, 223–187 B.C.). Apollophanes was friend and confidant of his royal master, acting as diplomat and advisor along with his medical duties at the Seleucid court, and he probably kept a journal which recorded some of the complicated diplomacy between Ptolemaic Egypt and Seleucid Syria, as well as thoughts on the looming shadows of the imperial Roman Republic (for which *vid.* Truesdell S. Brown, "Apollophanes and Polybius, Book 5," *Phoenix*, 15 [1961], 187–195, and F. W. Walbank, *A Historical Commentary of Polybius*, Vol. I [Oxford, 1957], 584–585). Apollophanes composed tracts on plasters and other pharmaceutical preparations, and his *Theriaka* seems to have been widely quoted (*vid.* Wellmann in Susemihl, *Geschichte*, I, 822). Glaucias of Tarentum (*fl. c.* 175 B.C.) was expert in the use of drugs and wrote respected tracts on medical dietetics, suggested by Athenaeus' borrowing Glaucias' account of the properties of lettuce; Deichgräber, *Empirikerschule*, 168–170, publishes ten short excerpts from Glaucias' lost works, and Michler, *Chirurgie*, 101–103, summarizes what is known about Glaucias of Tarentum. One wishes more had survived of the pharmacological writings of Mantias "the Herophilean" of Alexandria (*fl. c.* 130 B.C.), since titles include *Properties (Dynameis), The Apothecary at the Doctor's Stall (Pharmakopōlēs ho kat' iatreion)*, and *Cleansing (Peri kathartikēs)*, among several tracts which delineated drugs and their employment in medical therapies (for which *vid.* Michler, *Chirurgie*, 103–104; Wellmann in Susemihl, *Geschichte*, I, 825; and Fraser, *Alexandria*, I, 359, and II, 529 [notes and refs.]). Mantias became most famous as the teacher of Heracleides of Tarentum, one of the greatest physicians and pharmacologists of the Hellenistic era.

Heracleides of Tarentum (*fl. c.* 75 B.C.) was " . . . one of the most quoted doctors of the Hellenistic world" (Fraser, *Alexandria*, I, 361), and his high level of expertise on pharmacology commanded the respect of almost all later commentators, including the generally hypercritical Galen. The extensive fragments which have survived of Heracleides' works show him to be carefully schooled in drug lore (Galen says this was due to his teacher, Mantias), well educated in the finest of Greek literature and philosophy (suggested by the title of his major work on dietetics, *Symposium*), and certainly skilled in anatomy and surgical technique. Deichgräber, *Empirikerschule*, 172–202, publishes 78 frequently extensive fragments excerpted from Heracleides' *Pulses, Therapeutics, To Antiochis* (said by Galen to be the most important work on drugs and pharmacology), what Deich-

gräber labels "Die pharmazeutischen Fragmente" (Frgs. 192–202), *Antidotes, Cosmetics*, and the tract on medical dietetics, *Symposium*. Heracleides is clearly the most important pharmacologist between Diocles and the Aristotelians, and Dioscorides of Anazarbus (*fl.* A.D. 65); a study of Heracleides' drug lore would certainly add much to our knowledge of Hellenistic pharmacy, and elucidate some of the historical transitions of Greek pharmacology into its better known Roman form, as seen in the pages of Dioscorides and Galen. Deichgräber's published texts of the Empiric physicians also includes the summary (by Galen) of the basic concepts of pharmacology (*Empirikerschule*, 158–160 [Frgs. 126–130]), applicable to the drug lore of Heracleides of Tarentum. Fraser, *Alexandria*, I, 361–362, and II, 533–535 (notes and refs.) gathers the known data and collects the majority of useful bibliography on Heracleides.

Zopyrus of Alexandria (*fl. c.* 80 B.C.) seems to have been skilled in compounding styptics and in prescribing antidotes for poisons, and fragments of his writings on these and similar topics filter through the pharmacological doxography recorded in Galen. Deichgräber, *Empirikerschule*, 205–206, edits one major excerpt (Frg. 267: Galen quoting Apollonius Mys quoting Zopyrus) on antidotes, but merely lists the citations of seven quoted recipes from Zopyrus' works in the pages of Oribasius' *Medical Collection*. The compacted doxography in Galen's references to Zopyrus show that the traditions had recorded a link (by letter) between Zopyrus' knowledge of antidotes and the court of Mithridates VI of Pontus (King of Pontus, 115–63 B.C.). Mithridates is infamous in his own right as an "experimenter" (on living human beings) with poisons and antidotes, but Mithridates' chief physician, named Crateuas, was renowned as one of the finest botanical pharmacologists of his era (for which *vid.* M. Wellmann, *Krateuas* [Berlin, 1897]). Known as *the* Rootcutter (*Rhizotomos*), Crateuas quite probably was the author of one of the first illustrated herbals, setting a pattern followed in botanical manuals until the adoption of block printing in the European Renaissance. Oddly enough, although there are numerous references *to* the works of Crateuas, the only surviving direct quotations from his *Rootcutting (Rhizotomikos)* are from the famous and magnificent manuscript of A.D. 512, usually called the "Vienna Dioscorides," since the texts and illuminations of plants are of an alphabetical Greek version of Dioscorides' *Materia Medica*; the ten quotations were edited and published by Max Wellmann in *Pedanii Dioscuridis Anazarbei De materia medica* (Berlin, 1906–1914; 3 vols.), III, 144–146, preceded by 32 testomonia (139–144), chosen by Wellmann to suggest Crateuas' widespread influence. Manuscript illumination of plants (especially before the invention of the codex—our "book" form) is very much debated among scholars (for which *vid.* John M. Riddle, *Dioscorides on Pharmacy and Medicine* [Austin, Texas, 1985], 176–217), and Pliny's complaint (*Natural History*, XXV, 8) about the miserable and misleading paintings in works he has perused on medical botany, is most likely a mirror of reality (Crateuas is one of three authorities named in this particular context).

Zoology and toxicology were the special interests of Sostratus of Alexandria (*fl. c.* 30 B.C.), who seems to have provided one of the major accounts of the suicide of Cleopatra VII, who—as everyone recalling Elizabeth Taylor's motion picture portrayal or the words of Shakespeare will know—induced an Egyptian asp to bite her. Sostratus authored *On Striking and Biting* [Animals] and a general zoological tome, *On Animals*, but his major concern apparently was poison-lore, hearkening back to the tracts on toxicology by Apollodorus in the third century B.C. One is tempted to place Sostratus within the gloomy last years of the Ptolemaic court, but Fraser's carefully worded, "... Sostratus ... apparently lived to recount the death of Cleopatra" (*Alexandria*, 363), reflects exactly our basic uncertainty regarding Sostratus' association with the final days of Cleopatra. It is clear, however, that Sostratus was well read in the toxicological literature (for which *vid.* M. Wellmann, "Sostratos, ein Beitrag zur Quellenanalyse des Aelian," *Hermes*, 26 [1891], 321–350, and Fraser, *Alexandria*, II, 537 [notes and refs.]); Wellmann, "Sostratos," 346–349, edits and publishes 18 fragments from the lost writings *Striking and Biting Animals, Animals*, and what Wellmann terms "Aus seinen medicinischen Schriften." Poisons and antidotes would be primary concerns among rulers and monarchs, continually guarding against assas-

sination, and study of the drug lore of the Hellenistic kingdoms before the coming of Roman dominion reveals the definite role played by physicians, pharmacologists, and their drugs in the swirling levels of political intrigue.

[to be continued]

ADDENDUM:

Ancient Mesopotamian Drug Lore [*vid. Pharmacy in History*, 29, No. 2 (1987), 82]

Following the implicit judgment of Robert Biggs, "Medicine in Ancient Mesopotamia," *History of Science*, 8 (1969), 94–105, one hesitates to suggest the compilations of proposed nomenclatures of Assyrian herbs, plants, and mineral drugs as published by R. Campbell Thompson. Biggs warns that philological understanding of the languages written in the cuneiform is gradually improving, but that many specifics (especially exact names for plants) remain in the realm of conjecture, or are based on necessarily wobbly comparisons with Arabic, Hebrew, Syriac, Aramaic, Coptic, and other better known Near Eastern languages. Moreover, Thompson's books are exceedingly rare, so that only wealthy collectors or large university libraries would afford access to these fascinating—if unhappily doubtful—collections of pharmaceutical data from ancient Assyria. Nonetheless, it seems appropriate to list Thompson's admittedly pioneering efforts to explicate the herbal lore of ancient Assyria, while also issuing a strong caveat against trusting totally Thompson's identifications.

Thompson produced three major works on Assyrian herbal lore, botany, and what he called "chemistry": R. Campbell Thompson, *The Assyrian Herbal* (London, 1924 [reproduced by handwritten mimeograph stencils, with printed title page by Luzac; 294 pp. of stencils]); R. Campbell Thompson, *On the Chemistry of the Ancient Assyrians* (London, 1925 [reproduced by typewritten stencils, with printed title page by Luzac; 158 pp. of stencils, with handwritten Greek, Syriac, Arabic, Hebrew, and Aramaic + six printed plates of cuneiform texts]); and R. Campbell Thompson, *A Dictionary of Assyrian Botany* (London, 1949 [published postumously by the British Academy]; all cuneiform transliterated). Thompson also published a series of translations, which may prove enlightening: "Assyrian Prescriptions for Diseases of the Feet," *Journal of the Royal Asiatic Society* [no vol. number] (1937), 265–286 and 413–431 [the editor of the *Journal* has appended " . . . a list of works by the same author on similar subjects . . . " (431–432), which include several other translations by Thompson on medical topics]. Biggs, "Medicine in Ancient Mesopotamia," 103–105, provides a bibliographical listing of more recent scholarship, and among his citations are a number of translations into German, French, and English.

Byzantine Garden Culture

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Herbs of the Field and Herbs of the Garden in Byzantine Medicinal Pharmacy

John Scarborough

Among scholarly studies of Byzantine gardens are a number that provide details about what plants were grown and why they were cultivated as a common practice. Yet little attention has been paid to the botanical and pharmacal particulars of Byzantine garden lore. Moreover, even less well known are the all-season plant gatherers of the Byzantine Empire, plant collectors who continually augmented the herbal drugs of the monasteries. By focusing on some aspects of the gathering of wild specimens, which were, in many ways, "taken for granted," one receives a rather different picture of Byzantine botanical lore than if research depends solely on evidence drawn from gardens.

An interested student or scholar wishing to inquire about the essentials of herbalism in the Byzantine Empire likely will be led into the Greek texts on gardens, well illustrated by the Christian "dream garden" as published in Greek, with a French and now English translation, by Margaret Thomson.[1] Within are, indeed, the expected fruits and vegetables, sweet smelling and pleasantly verdant, along with some descriptions of "how to plant a garden." Presumably technical names, however, are not intended as a guide for the reader, but rather suggest how an ideal garden would appear. For example, in Thomson's text is the "knowledge of *smilax,*"[2] and one reads an ethereal account of the possible shapes of such a tree, but nothing one could designate as "practical." Thomson's notes on *Jardin,* 21, indicate biblical allusions, but nothing concerning botanical, agricultural, or medical utility. *Smilax* here is a tree (*to dendron*), so that one need not bother to consider other plants with the same name, for example, the cowpea or cherry bean as described by Dioskorides,[3] or the European sarsaparilla first noted by Pliny the Elder and Dioskorides,[4] probably drawing information

[1] M. H. Thomson, ed. and trans., *Le jardin symbolique* (Paris, 1960); and *The Symbolic Garden: Reflections Drawn from a Garden of Virtues. A XIIth Century Greek Manuscript* (North York, Ont., 1989).

[2] *Le jardin symbolique,* 68–77; *The Symbolic Garden,* 86–95.

[3] *Vigna unguiculata* L. = V. sinensis Endl., the cowpea or cherry bean, as in Dioskorides, *Materia medica,* 2.132 and 146 (Greek text ed. M. Wellmann, *Pedanii Dioscuridis Anazarbei De materia medica,* 3 vols. [Berlin, 1906–14; repr. Berlin, 1958], 1:132 and 146).

[4] *Smilax aspera* L., Dioskorides, 4.137 and 142 (ed. Wellmann, 2:282–83 and 285–86). Pliny the Elder, *Natural History,* 16.163 and 24.82–83. The common source is probably the lost tract on medical botany by Sextius Niger (fl. probably early 1st century).

from a common source; nor does one need to posit the infamous scammony (occasionally called *smilax*) with its well-known cathartic resin.[5]

Two trees are possible: *Taxus baccata* L., the so-called English yew, renowned in medieval Asia Minor for its heavy and hard, yet elastic, wood (thus the English "yew-bow" of folklore[6], and, second, the ever-popular tree of an enchanted grove, the holm oak (*Quercus ilex* L.),[7] with its prickly, hollylike sucker-shoot leaves. Centuries earlier, Theophrastus had remarked that the name is "Arcadian," and since Thomson's text leaves little doubt about the fairy-tale purpose of the anonymous writer, it seems clear enough that this famed "dream garden" manual is just that: an imaginary world of fragrances and wafting breezes, of pruned shapes and colorful flowers and equally colorful fruits edible only with the nose and eyes. Thomson attributes this "garden of the imagination" to the eleventh century,[8] and there is an ancestry in similar tracts of pagan antiquity, such as those published by A. Delatte in the *Herbarius.*[9] Delatte's texts retail the plants of medical astrology, with seven major kinds of plants linked with planets also of extremely important ceremonial use and prominence in mythology.

Yet this genre of the "dream garden" manual represents only one facet of Byzantine garden lore and herbalism. Too often, moderns ignore other types besides this religio-mystical "symbolism" of specific plants: Thomson herself had called attention to other and varying traditions of more practical utility in her seldomly cited *Textes grecs inédits relatifs aux plantes,*[10] texts in themselves supplementary to those on botany (and other topics) as edited and published earlier by Delatte.[11] Important is Thomson's section of Greek texts (with French translations) of botanical lexicography,[12] paralleled by Delatte's fifteen botanical glossaries,[13] only slightly emended by J. Stannard.[14] Delatte's glossaries include one by a Pseudo-Galen,[15] nine by anonymous authors, one by a Pseudo-Symeon Seth,[16] and one each by Neophytos, Nikomedes, and Nicholas Hieropais, followed by Thomson's Greek text of a "Lexicon of Arabic Plant Names,"[17] leading into several more tracts of similar content and with the obviously intended purposes of pure lexicography. These are not the vaguely perceived or

[5] *Convolvulus sepium* L. is the most common, cosmopolitan species of scammony, still used in Greece, Turkey, and Syria as a powerful cathartic. In some botanical guides, the plant bears the name *C. scammonia.* Why *Smilax,* in ancient Greek botanical nomenclature, should sometimes take the place of *skammonia* is a lexicographical mystery. The scammony's main pharmaceutical action is its properties to cause large amounts of bodily fluids to be evacuated, which explains why many modern herbal manuals describe it as a "diuretic."

[6] Dioskorides, 4.76 and 79 (ed. Wellmann, 2:88–89 and 92–93). Pliny the Elder, *Natural History,* 16.51.

[7] Theophrastus, *Historia plantarum,* 3.16.2; Pliny the Elder, *Natural History,* 16.19.

[8] Thomson, *Le jardin symbolique,* 10–11; *The Symbolic Garden,* 10–11.

[9] A. Delatte, *Herbarius: Recherches sur le cérémonial usité chez les anciens pour la cueillette des simples et des plantes magiques* (Paris, 1938).

[10] Paris, 1955.

[11] A. Delatte, ed., *Anecdota Atheniensia et alia,* vol. 2, *Textes grecs à l'histoire des sciences* (Paris, 1939).

[12] Thomson, *Textes grecs,* 125–77.

[13] Delatte, *Anecdota,* 273–454.

[14] J. Stannard, "Byzantine Botanical Lexicography," *Episteme* 5 (1971): 168–87.

[15] Delatte, *Anecdota,* 385–92.

[16] Ibid., 339–60.

[17] Thomson, *Textes grecs,* 139–67; Delatte, *Anecdota,* 279–318, 331–39, and 393–417.

fancifully aromatic plants of the symbolic garden: rather these spare listings show repeated attempts at precision in nomenclature, attempts forecast quite early by the multilingual synonyms provided by Dioskorides and later scholiasts,[18] augmented first by an obscure Pamphilus about a century after the original *Materia medica* appeared,[19] and by the "Synonym Lists" of drugs circulating by the second century, illustrated by the Galenic tract under this title.[20]

The Greek tracts published by Delatte and Thomson are ample evidence of an herbalism among the Byzantines, an herbalism rather far removed from the redolently imaginary gardens of pagan and Christian myth. Such treatises also tell us immediately that doctors, pharmacologists, herbalists, *and* farmers not only were very interested (and literate), but also required information about wild as well as cultivated plants: some were used as medicinals, others for the manufacture of ointments and perfumes (especially the numerous "oil plants"), others as food sources on a seasonal basis, still others as condiments, and, of course, as sources of the species transplanted and carefully tended in the well-known gardens of both the Byzantine East and medieval Latin West, with similar and carefully cultivated gardens also characteristic of the Islamic world.[21]

Yet even a short survey of this kind of modern study, representing excellent scholarship and detailed command of the texts and multilingual sources, shows the predominance of an "ideal garden," when a scholar considers medicinal plants or potherbs (e.g., J. Stannard, G. Keil, and C. Opsomer-Halleux in the 1986 *Medieval Gardens*).[22] This tendency is widespread

[18] Most of the presumed synonyms are set below the text of Dioskorides in the Wellmann edition, with the clear designation RV, in turn given parallel readings in other sources by the editor as part of the apparatus criticus.

[19] M. Wellmann, "Pamphilos," *Hermes* 51 (1916): 1–64.

[20] Often cited as "Galen, *Glossary,*" the first set of synonym lists in the Galenic corpus appear in C. G. Kühn, ed., *Claudii Galeni Opera omnia,* 20 vols. (Leipzig, 1821–33; repr. Hildesheim, 1964–65), 19:62–157. The second set of exegetical references and synonyms are in the same volume, 721–47; the first of the pair is devoted to explicating "puzzling" words and definitions of Galen's ideal, Hippocrates; the second tract (if either is genuine: some scholars believe both are Renaissance forgeries) provides a set of "quickie" remedies in a kind of "Substitution List," not synonyms. Apparently whoever compiled this "Substitution List" was well aware that many drugs as listed in the Greco-Roman "Galenic" texts were not available locally from time to time, so such "substitution of drug B for the usual recommendation of drug A" became a model for later Byzantine Greek, classical Arabic, and medieval Latin glossaries of this sort. Unhappily, many scholars have confused Galen's *Glossary* (best read as a series of explications of earlier medical terminologies, including those from the Hippocratic corpus) with the *Substitutions,* so that the novitiate may gain a reference from the *Glossary,* when in actuality it emerges from *Substitutions.* Much of this confusion is nicely laid to rest by R. J. Durling, *A Dictionary of Medical Terms in Galen* (Leiden, 1993), to which an interested scholar should first resort, especially for the sometimes more-than-obscure terms of pharmacology.

[21] Illustrative are the following: A. Watson, *Agricultural Innovation in the Early Islamic World: The Diffusion of Crops and Farming Techniques, 700–1100* (Cambridge, 1983); E. B. MacDougall and R. Ettinghausen, eds., *The Islamic Garden* (Washington, D.C., 1976); D. N. Wilber, *Persian Gardens and Garden Pavilions,* 2d ed. (Washington, D.C., 1979); E. B. MacDougall, ed., *Medieval Gardens* (Washington, D.C., 1986). For Muslim Spain, one of the better studies is L. Bolens, *La cuisine andalouse: Un art de vivre, XIe–XIIIe siècles* (Paris, 1990).

[22] J. Stannard, "Alimentary and Medicinal Use of Plants," in MacDougall, *Medieval Gardens,* 69–92; G. Keil, "Hortus Sanitatis: Gart der Gesundheit. Gaerde der Sunthede," ibid., 55–68; and C. Opsomer-Halleux, "The Medieval Garden and Its Role in Medicine," ibid., 93–114.

in the specialist literature, and particularly characteristic (perhaps appropriately) of the numerous books on medieval English botanical lore, exemplified by the work of Teresa McLean.[23] One can, to be sure, argue that humankind's occupation and cultivation of Europe and the Near East had consumed millennia, and thereby truly feral areas were unusual (unlike the New World in 1492, which was almost *all* wild, with the exceptions of certain Amerindian cultures that flourished and passed away long before the arrival of Europeans), so that "wild" herbs were presumably unimportant in the pharmacal lore of classical antiquity and the Middle Ages.

Our texts, however, demonstrate vividly that physicians in ancient Greece, the Hellenistic world, the Roman Republic, and the successor empires of the Roman and Byzantine centuries, knew and valued *both* wild and cultivated plants, employed as drugs; such are fully attested in the works of many Byzantine physicians and pharmacologists, ranging from Alexander of Tralles to John Aktouarios. In fact, Byzantine concepts of what *was* herbal medicine were fundamental in the teaching of herbal pharmacology in the medical schools of Renaissance Europe; many of these teaching institutions boasted of their own "teaching gardens" that incorporated traditionally cultivated potherbs along with "wild herbs" gathered from local countrysides (with information on the curative powers of these plants also derived from local folklore); soon added to these often beautiful and scrupulously planned teaching gardens were the ever-increasing numbers of "new and wild" botanicals from the New World, Africa, and Asia.[24] And as one would expect, culinary arts overlapped pharmacy in the discussions of plant properties (or "virtues" as they were often termed), so that foods and foodstuffs became part of herbalism in almost all eras.[25] The Byzantines valued such expertise, and some recent scholarship has begun to explore how Portuguese, Spanish, and English, alongside long-term Venetian, trading ventures came to improve the Byzantine diet.[26]

Medical botany is quite prominent in Byzantine medicine, and, as I have indicated elsewhere,[27] early Byzantine pharmacy occupies a central role in how the doctor treats disease, in company with how the physician perceives the "properties" (here usually *dynameis* in the Greek as one explicates how drugs "work"). Our written texts, from Oribasios to Paul of Aegina, repeatedly show how the Byzantine philosopher-physicians (and those sometimes known as iatrosophists) reworked, streamlined, augmented, and clarified the medical and pharmacological texts of the Greco-Roman era. Dioskorides' great *Materia medica* (ca.

[23] *Medieval English Gardens* (London, 1981).

[24] There is an enormous bibliography on the "introduction" of new species into the pharmacal lore of Europe in the Renaissance. For a summary and collection of references, see J. Scarborough, "Botany, Pharmacy, and the Culinary Arts," in A. C. Crombie and N. Siraisi, eds., *The Rational Arts of Living* (Northampton, 1987), 161–204.

[25] This interplay is well demonstrated in two monographs (among many): R. Howard, *La bibliothèque et le laboratoire de Guy de la Brosse au jardin des plantes à Paris* (Geneva, 1983), and W. T. Stern, *Botanical Gardens and Botanical Literature in the Eighteenth Century* (Pittsburgh, 1961).

[26] Most recently (among the welcome interest in "food history" by classicists and medievalists), one may consult with profit A. Dalby, "Biscuits from Byzantium," *Siren Feasts* (London, 1996), 187–211.

[27] J. Scarborough, "Early Byzantine Pharmacology," *DOP* 38 (1984): 213–32.

A.D. 70) had become *the* basic treatise on all aspects of pharmacology and pharmacognosy, and pure botany continued to be represented by Theophrastus' rightly honored *Inquiry into Plants* and *Causes of Plants* (both ca. 300 B.C.). It is, however, Galen of Pergamon (A.D. 129–after 210) who became the absolute authority on all facets of medicine in the Eastern Roman Empire, especially after Oribasios of Pergamon (ca. A.D. 325–400) had performed probably the first known of many attempted truncations, summaries, and rearrangements of Galen's often massive, self-contradictory, and presumably all-inclusive works on medicine (the often-cited edition by C. G. Kühn [Leipzig, 1821–33; repr. Hildesheim, 1963–64] occupies four linear feet on one of my bookshelves).

This overriding authority is further attested by the "Seven Physicians" folio of the A.D. 512 Vienna manuscript of Dioskorides (fol. 3v),[28] which, accompanied by the previous "seven physicians" of folio 2v, provides a pictorial "history of medical authorities" in the early sixth century (notably absent is Hippocrates of Cos). Galen sits top and center on folio 3v, flanked by Dioskorides and Krateuas, the former the major author of this beautiful, alphabetical version of Dioskorides' *Materia medica*. And although one admires the occasionally magnificent (and one growls at some of the paintings, which are dreadful) illuminations of Dioskorides' plants, Nicander of Colophon's poisonous creatures, and some other topics including a manual of ornithology by an otherwise unknown Dionysius, *all* are but

[28] Regarding the famous Vienna codex (properly cited as Codex Vindobonensis med. gr. 1 der Österreichischen Nationalbibliothek), two reproductions of what constitutes 485 folios (weighing 14 lbs.) have appeared in the 20th century: the first was published in Leiden in two volumes by A. W. Sijthoff (1906), with the first volume of descriptive commentary and the second of black and white reproductions of the folios; useful in its day, this *De codicis Dioscuridei Aniciae Iulianae, nunc Vindobonensis Med. Gr. I* (with commentary by A. de Premerstein, C. Wessely, and J. Mantuani), has been completely superseded by the full-color, full-sized reproduction (five volumes, with a sixth containing commentary and listings by H. Gerstinger) published by the Akademische Druck- u. Verlagsanstalt (Graz, 1970). Unlike the 1906 Leiden edition, the 1970 reproduction has full commentary on the other works represented (other than a shortened, alphabetical version of Dioskorides): an anonymus *Poem on the Properties of Herbs* (fols. 388–392); two paraphrases of Nicander's *Theriaka* and *Alexipharmaka* by an otherwise unknown Euteknios (fols. 393–459 [many illuminations scattered here and there in the margins, with many accurate renderings—especially of the blister beetles—and many purely imaginary images of the poisonous creatures retailed by Nicander of Colophon]); a paraphrase of Oppian's *Book on Fishing,* again by Euteknios (fols. 460–473 [the illuminations, however, seem more intended to accompany pseudo-Oppian's lengthy poem, *On Hunting*]); and, finally, a paraphrase of an *Ornithology* (Grk. *Ixeutika*) by an (again) otherwise unknown Dionysios (fols. 474–485 [fol. 483v shows twenty-four birds, quite vividly painted from life]). Most large libraries have copies of the Graz reproduction volumes; I apologize to my readers for my inability to gain permission to reproduce relevant folios from Vienna in time for publication. One can, however, peruse the selection of illuminations, reproduced in full color and size, in O. Mazal, *Pflanzen, Wurzeln, Säfte, Samen: Antike Heilkunst Miniaturen des Wiener Dioskurides* (Graz, 1981), a volume held much more commonly in university libraries. It is interesting to speculate about the first illuminated folio, showing a peacock (male, with feathers spread in the "courting" position), presumably the family's animal (a kind of 6th-century coat of arms), and reflect how this peacock precedes the famous two folios of famous physicians, not to mention the portrait folio 6v, showing the princess Anicia Juliana and her attendants. The tale of how this magnificent manuscript survived to be deposited in the Hapsburg collection in the 16th century is a tale worth telling in itself, perhaps best summarized by G. Sarton, "Brave Busbecq," *Isis* 33 (1942): 557–75. Anicia Juliana was known as a generous benefactor in her day, as suggested by M. Harrison, *A Temple for Byzantium: The Discovery and Excavation of Anicia Juliana's Palace Church in Istanbul* (London, 1989). On this manuscript, see also Leslie Brubaker, "The Vienna Dioskorides and Anicia Juliana," in this volume, 189–214.

selections from the complete works; but those that do appear give us a reasonable guide to which plants were deemed useful in early sixth-century Byzantine pharmacology. It is important likewise that one have in hand the complete, nonalphabetical Greek text of Dioskorides (last and best edited by Max Wellmann in 3 vols. [Berlin, 1906–14; repr. 1958]), so that one can gain a clear impression of which plants were deemed useful in sixth-century Byzantine pharmacology including plants gathered in the wild and those emerging from one of the countless gardens, so appropriately recapitulated and condensed in several books in the tenth-century *Geoponika.* Sometimes what is omitted in the Vienna text of Dioskorides (admittedly our earliest medical manuscript in Greek) is surprising, but inclusion of a plant per se suggests a reader may be presumed to have "known" a more complete account: that the 14-pound codex was not intended as a "field manual" should be apparent, but even as a "royal gift" fit for a princess, the codex is a valuable guide to what plants were thought valuable for a household in the highest levels of the ruling class of the Byzantine Empire in the sixth century.

One example will serve to illustrate the question of "herbs in the field" and "herbs of the garden" as would be depicted in the Vienna manuscript: the opium poppy (*Papaver somniferum* L.).[29] Folio 221v gives a reasonably accurate painting of the opium capsules in the various stages of growth (the leaves are not well depicted, but at least the pinnate edges receive emphasis; the *P. somniferum* does not have multilobed, pinnated leaves as here represented by the unknown artist), and the root stock is somewhat of the "generic" type.

Here is what Dioskorides, 4.64 (ed. Wellmann, 2:218–21; my trans.) has to say about this famous and presumptive analgesic:

> 1. [The opium] poppy. Some is cultivated and grown in gardens, from which the seed is made into bread, and becomes part of a healthy diet; and with honey, they use the poppy seed in place of the sesame seed, and thereby it is called the "common poppy," which has a longish head and a seed that is white. Another kind that is wild has a capsule head that droops, a seed that is black, and is called the "corn poppy," and some term this "rhoias" on account of the juice flowing from it. But there is a third kind of these poppies, much less cultivated, and it is smaller and more useful as a drug; this type has a longish capsule.

Then follow medical and pharmaceutical uses, and Dioskorides makes explicit the variations between the "cultivated" and "wild" poppies (4.64.5 [ed. Wellmann, 2:221; my trans.]):

> Best is the latex (or "juice," = *opos*) which is thick and heavy of the wild kind; it is soporific to the person who smells it, bitter to the taste, easily diluted in water, smooth, white, neither rough nor full of lumps, nor does it congeal as it is passed

[29] For a discussion of both ancient and modern views of opium, see J. Scarborough, "The Opium Poppy in Hellenistic and Roman Medicine," in R. Porter and M. Teich, eds., *Drugs and Narcotics in History* (Cambridge, 1995), 4–23.

> through a sieve as would be characteristic of wax; and set down in the sun and allowed to spread out while melting [identifies it as genuine]; and set alight from an oil lamp, it does not have a darkly colored flame, retaining indeed the odor of its own particular property. Some, however, counterfeit it by mixing the juice of the horned poppy or acacia gum or the juice of the wild lettuce.

This is the text readers and viewers of the famous Vienna codex of the *Materia medica* would have known and consulted; Dioskorides has warned previously (4.3 [ed. Wellmann, 2:119]) that too much of the wild latex can kill, so that the physician-pharmacologist had to use great care in its employment. Several points are important, even in this short account of the opium poppy: some poppies are, indeed, part of garden plots, and would remain so from Roman times through the twentieth century (many botanical gardens today proudly display their specimens of this famous plant, sometimes with a guard closely observing the visitors); those poppies that are cultivated are raised for their oilseeds, and they remain a staple in the production of breads (the ancients were well aware that there are no narcotic properties in the seeds); and, as Dioskorides and the Vienna version make clear enough, it is the *wild* variety that is gathered for the ill-famed soporific and occasionally for its death-dealing properties. These uses were well known to Nicander of Colophon (fl. ca. 130 B.C.) and his sources,[30] so that wild and cultivated poppies are part of the long history of classical and Byzantine gardening culture, as well as the lore of gathering the latex from the maturing plant in the field.

It is unlikely that the artist who rendered the opium poppy on folio 221v of the Vienna codex has painted from life, but he *has* captured the four basic stages of the life cycle of the capsules' development (harvesting the best latex is detailed in Dioskorides, 4.64.7 [ed. Wellmann, 2:221]), and except for some slightly more sophisticated knives and collection pans, the methods of modern harvesting of the *P. somniferum*'s latex from the capsules *just before they ripen* (almost exactly what Dioskorides records) remain almost identical. Moreover, ancient pharmacologists and their Byzantine successors were well aware that there were several varieties of poppies, ranging from a truly "wild" kind (Vienna codex, fol. 222) through less potent varieties (fols. 223v, 224v, and 225v). The scholia on poppies in the text of Dioskorides are not particularly revealing of Byzantine gardeners' or physicians' experiences that might have varied from the textual tradition, so that it would seem that later doctors and pharmacologists found that Dioskorides was essentially correct. That same textual tradition, beginning in the second century, suggested that repeated employment of the opium poppy latex thus generally verified the account of Dioskorides, confirmed as one examines parallel passages, condensed by Oribasios, or elaborated by Alexander of Tralles, and a few others, conveniently listed in Wellmann's apparatus criticus.

Yet the Byzantine scribes did not simply parrot their classical texts in medicine and related matters, and one can choose no better example than that selected by John Riddle, in

[30] Scarborough, "Opium Poppy," 11.

his fine essay of 1984,[31] to illustrate two matters: (1) additional information by later and obviously experienced gardeners and physicians; and (2) parallel traditions accompanying the texts of the *Materia medica,* in this instance an almost exact match with a series of passages in the *Geoponika.* When Riddle submitted his essay for inclusion in the published collection of papers resulting from the 1983 Dumbarton Oaks Symposium on Byzantine Medicine, I was happy to augment his arguments on asparagus with the *Geoponika,* and I think it quite appropriate here to call attention to these again.

Dioskorides, 2.125 (ed. Wellmann, 1:198; my trans.), had written that "some" (in his usual manner of giving a report that he has heard but did not necessarily believe) "have set down that if someone were to bury rams' horns broken into small pieces, asparagus grows." A scribe, sometime before the fourteenth century, flatly denied this, saying in his scholiastic comment, "this appears incredible to me," and, as Riddle notes, this *emoi de apithanon* appears in at least ten variant manuscripts of Dioskorides' discussion of this common garden vegetable. And although Riddle did not make particular note of Dioskorides' account of the utility of the asparagus, it is clear (again) that both wild and garden-grown varieties are included: the feral sort grows in rocky soils, the cultivar as one would expect in the soils prepared for other vegetables (medicinal uses are those well known in many folk traditions: bowel softener, diuretic, treatment for sciatica and jaundice, as a remedy for toothache, and as an antidote for the bites of poisonous spiders). Perhaps the gardener is attempting to duplicate the "rocky" soil for his asparagus plot (a tricky and long-term vegetable to grow as any modern gardener all too well knows), but of importance is the parallel passage in the tenth-century *Geoponika* (last edited by H. Beckh as *Geoponica sive Cassiani Bassi scholastici De re rustica eclogae* [Leipzig, 1895; repr. Stuttgart, 1994]),[32] which reads: "If one wishes to produce an abundance of asparagus, chop up horns of the wild ram into small pieces, throw them into the asparagus beds, and water them. Some [others] say that it is better if the whole rams' horns are bored with holes and then put down into the soil, they will produce asparagus" (*Geoponika,* 12.18.2–3 [ed. Beckh, p. 365; my trans.]).

Quite puzzling in this passage is its description of technical details: is the would-be gardener being advised to put rootstocks (or crowns) of old asparagus into the holed rams' horns? Growing edible asparagus from seeds gives poor yield, but crown-growth from permanent beds can yield annually (after the third year); the tender shoots of springtime (in temperate climes) can be harvested repeatedly for up to twenty years. One is, however, struck by the *Geoponika* extract that both a "wild" and a "cultivated" sort are known and used. The extract (if we can rely on the copyists of the tenth century) is quoted from a Didymus, probably the Didymus of Alexandria known to have written a fifteen-book *Georgika* in the fifth century, and if Wellmann is right,[33] Didymus was a physician of some repute. The mix of agricultural and pharmacological data remains explicit, and the passage in Dioskorides neatly interlocks with that of Didymus as quoted in the tenth-century *Geoponika.*

[31] J. M. Riddle, "Byzantine Commentaries on Dioscorides," *DOP* 38 (1984): 95–102.

[32] On this text, see also Robert Rodgers, "Κηποποιΐα: Garden Making and Garden Culture in the *Geoponika*," in this volume.

[33] M. Wellmann, "Didymus," *RE,* vol. 9 (Stuttgart, 1903), 445.

The Byzantine text is incorporated into the book "on" gardens (e.g., 12.2 [ed. Beckh, pp. 349–50]), quoted from an otherwise unknown Florentinus, and headed "How to make a garden," with a preceding "gardening calendar" (12.1.1–2 [ed. Beckh, pp. 347–49]): January through December, with each month specified with plantings "as is suitable for the climate of Constantinople." As one reads through the accounts of the particular vegetables and foodstuffs (asparagus, lettuce, beets, cabbages, and so on), one notes again and again that there are "wild kinds" also to be harvested, and one again can use the exemplar of the asparagus: *Geoponika* 12.18.4 and 5 (ed. Beckh, p. 365) tells us that in order to have asparagus year-round, one is to take the seeds [?: such are really more akin to "berries"] and weed around the surface roots, a description that can match only what one finds in the growth patterns of the still common "wild asparagus" of Turkey; its underground stem grows horizontally, which then produces the spring shoots that are very tender and tasty, the so-called turions. Gathering asparagus, for both medical and culinary purposes, thus includes garden lore as well as a common knowledge of how this vegetable favors sandy soils. Modern California's January "asparagus spears," so horribly expensive in a Wisconsin winter, are, in some respects, quite like those gained by herbalists in fifth-century Alexandria and tenth-century Constantinople. And these were gathered and marketed by professional "herbalists," not gardeners of the town. These "herbalists" were indeed "farmers" addressed and assumed to be literate, an assumption by the compilers of the text we have as the *Geoponika*. This manner of mixing the cultivars with the gathering of "wild" species, for the sake of (one presumes) freshness, could be illustrated by several accounts in *Geoponika* 12 and in other books of the same compilation that address plants and their employment as drugs, foods, or condiments.

My last example of the continual intermeshing of farm and field with the geometrically pleasing "ideal gardens," so common in medieval times from England to Bombay, had more to do with veterinary practices than with vegetables, but will illustrate the same point: knowledge flowing both ways, from city to countryside and back again, perhaps "corrected" or "refined" for the city slickers. We have to keep in mind that most people lived in the country in those days, with a few making a living knowing the plants to be gathered, while the great majority tilled the fields of one or another overlord, living out their years as had their forefathers before them. Life in the country, however, was not without its special realms of pure knowledge. Country dwellers (*pagani* in Latin) "knew" the plants: they did not "name" them, a habit that reaches back as far as Mycenaean times and Homeric Greece, if not to the beginnings of our species somewhere in northeastern Africa some many millennia ago.

Alongside the domestication of wheat, rice, barley, oats, and several other food plants came the domestication of animals. We do not know "when" these processes were firmly in place, but with the creation of urban centers in Mesopotamia, China, India, Egypt, and elsewhere after about 7000 B.C., we find animals side by side with the plants on the farms (by whatever name) most of the human population tilled. From the very beginnings, people and animals transferred illnesses to one another, but, except for the worst of the plagues, it would seem that most of what today we would call illnesses went unnoticed, as a part of

normal life. Even so, as we learn in the late texts we know as the *Geoponika* and the collection of excerpts from the same era which we call the *Corpus hippiatricorum Graecorum,*[34] farmers and horsemen had many problems with parasites on and in their animals, and I have chosen one very intriguing passage in the *Geoponika* that indicates Byzantine sheep herders *did* deal with ticks and other irritating pests. Indeed, the modern world is coming back to something like these natural insecticides or vermicides, since there would be, by definition, very few (if any) "side effects" or long-term damage to either the environment or to the productive capability of the sheep and their prized wool. *Geoponika* 17.16 is headed "Concerning lice. From Didymus," and one reads (ed. Beckh, p. 495; my trans.):

> 1. If sheep have ticks or lice, pound thoroughly some maple tree roots and boil this mash in water; part the wool on the sheep from head to the end of the spinal column, and then pour this liquid on while still warm, so that it finds its way over the whole animal's body. Some use cedar oil in the same way.
> 2. Some others likewise in a similar fashion prepare mandrake root for this use, but one must ensure that the animals do not ingest this mandrake root wash, since it is poisonous to them.
> 3. Others prepare likewise in a similar fashion a decoction of cyperus root and wash the sheep with it.[35]

From the modern vantage, the phytochemistry and the "logic" of using a maple root wash and its tannin as an excellent flea- and tick-repellent, makes good sense, but the cyperus root's chemical properties remain obscure. At this juncture, however, I wish to emphasize the curious appearance of mandrake as a "delouser" for sheep.

Mandrake (*Mandragora officinarum* L. or *M. autumnalis* Spr.), among the six species known in ancient and modern times, contains goodly amounts of hyoscyamine, a powerful narcotic, especially in the famous "manlike" roots. The narcotic properties of the mandrake were famous among laypersons and professional medical practitioners, and its fame reached even into a well-known scene in Apuleius' *Golden Ass,*[36] where the physician and those listening to his testimony *both* knew of the generally safe anesthetic properties of mandrake. Mandrake leads us immediately back to the Vienna codex of Dioskorides: widely known is folio 5v, depicting three figures doing three things with the mandrake root (and *this* painting of the root [twice] is not replicated elsewhere in the codex); on the right is Dioskorides reading the account of the plant and its properties (4.75 [ed. Wellmann, 2:233–37]); in the center Epinoia holds the root in her hands extended in front of her to ensure that the

[34] E. Oder and C. Hoppe, eds., *Corpus hippiatricorum Graecorum,* 2 vols. (Leipzig, 1924–27; repr. Stuttgart, 1971). Most recently, a third compilation of this sort from the mid-10th century on toxicology has been documented by Sibylle Ihm, ed., *Der Traktat Peri tōn iobolōn thēriōn kai dēlētēriōn pharmakōn des sog. Aelius Promotus* (Wiesbaden, 1995).

[35] I suspect that *kypeiros* is not galingale, but either the edible cyperus (*Cyperus esculentus* L.), or perhaps a turmeric (*Curcuma longa* L.), known as early as Dioskorides, whose *Materia medica,* 1.5, seems to be the first mention of this Indian rhizome, today used as a condiment in curries.

[36] Apuleius, *Golden Ass* (or *Metamorphoses*), 10.11.

viewer sees exactly its color and shape; and on the left of the full-page folio is the artist depicting the plant while he looks at Epinoia, not Dioskorides. Mandrake is, in effect, the first medicinal plant in the codex, and Dioskorides' full description of the properties and uses of mandrake root parallels its employment today in many folk medical systems from Spain to India: it is an excellent purgative and emetic, with narcotic properties particularly valuable in treatment for asthma, hay fever, and coughs, since the alkaloidal phytochemistry in the "natural" drug acts as vasodilators. There are numerous references in the medical sources of classical antiquity, as well as those of the Byzantine era: mandrake was the narcotic of choice, or, as Dioskorides puts it, "The physicians use this whenever they are about to begin cutting [i.e., surgery], or when they are cauterizing [a wound] shut" (4.75.7 [ed. Wellmann, 2:237; my trans.]).

Garden plant or wild? Evidence shows (again) both. In the text "On the Mandrake," printed by Thomson in her *Textes grecs inédits* (pp. 84–87; numbered texts 5, 3, and 4), it is clear that this is indeed an herb raised and used against leprosy and eye diseases and as a remedy for raging diarrhea, among other afflictions. Older traditions (e.g., Theophrastus, *Historia plantarum,* 9.9.1 and Dioskorides as above) indicate that mandrake was brought into market by ever-present and expert *rhizotomoi* ("root cutters").

Throughout the centuries, there is little doubt that anyone could obtain mandrake in just about any season, as would be true of the opium poppy and its hardened latex, easily remelted as needed. Among the Byzantines, one gains the sure impression from Alexander of Tralles' directions for the preparation of pastilles for specific treatment of quartan fevers characterized by yellow bile,[37] that *all* ingredients are commonly obtained and that many are "garden cultivated": one reads about the saffron crocus, licorice, anise, castor (a plant in this instance), henbane (if this, indeed, is what *hyoskyamos leukos* means), and likely enough the three grams of mandrake "bark" (the outer layers of the root) that end the preparation formula. Alexander of Tralles is recording what he considered "tried and true" pharmaceutical recipes sometime at the very end of the sixth century or, at the very latest, the beginning years of the seventh. A principle of his practice and its written summary is almost always a direct simplicity, a characteristic especially true of his botanical or medicinal pharmacy. The opium poppy is an "ordinary" drug, much as is mandrake (whether its "apples" or juice or rind or stem or roots). Alexander's long career and extensive travels (he died in Rome in A.D. 605) enabled him to compose several medical masterpieces, including the *Book on Fevers,* the *Twelve Books on Medicine,* and the *Letter on Intestinal Worms* (this last tract is the first western treatise on parasitology and deserves careful translation and commentary). He has carefully selected drugs readily obtained from feral areas and then brought to the marketplace, or, as one would expect, from the common herb gardens; such cultivated plots included well-known poisons like aconite, the two hellebores, henbane, and the ever-infamous hemlock, not to mention the commonly employed female contraceptives, pennyroyal and rue. In both pharmacy and cooking, in the manufacture of perfumes or the flavorings of

[37] Alexander of Tralles, *Book on Fevers,* 7 (ed. T. Puschmann, *Alexander von Tralles,* 2 vols. [Vienna, 1878–79; repr. Amsterdam, 1963], 1:426–29, especially formulas and measures, 429).

wine, "fresh" was a mark of quality, so that "out of season" would engender the ordinary assumption of the continual activity of farmers and the *rhizotomoi* (who were in all likelihood farmers too) who gathered herbs for the market stalls, so nicely recorded by Pollux in the second century.[38]

In summary, even a short study reveals food and medicinal sources in the Byzantine Empire rather well balanced by city and countryside. Wheat, barley, and other long-cultivated staples continued to be planted and harvested by the traditional farmer, and his stock (whether pigs, chickens, and so on) contributed the major part of each Byzantine city's food supply. Herb gardens existed almost in all cities in great numbers, but much of what we know of Byzantine drugs, condiments, perfume production, and several other "luxury" products (e.g., wine flavorings), and the frequently ignored production of the best grapes for the finest wines, remained (obviously) products of the country dwellers. In medicinal pharmacy, Byzantine root gatherers and farmers at large provided specific herbs, especially "out of season," suggested by the examples of asparagus, the opium poppy, and mandrake.

University of Wisconsin, Madison

[38] Pollux, *Onomasticon,* 5.132 (ed. E. Bethe, *Pollucis Onomasticon,* 3 vols. [Leipzig, 1900–1937; repr. Stuttgart, 1967], 1:297).

EARLY BYZANTINE PHARMACOLOGY

JOHN SCARBOROUGH

INTRODUCTION

The study of Byzantine drug lore presents the modern scholar with several problems. At first glance, it would appear that Oribasius, Aetius of Amida, Alexander of Tralles, and Paul of Aegina have simply replicated data and nomenclature found in the works of Dioscorides, Galen, and other earlier Greek and Roman accounts of herbs and herbals, medicinal minerals, and animal products employed in the manufacture of drugs. Yet when one investigates carefully the Greek texts of all four of these major so-called compilers in the history of early Byzantine medicine, one soon discovers that there are indeed duplications from Greco-Roman authorities in consideration of drugs and drug lore, but that the theory of drug-action has shifted in an important manner, and also that substances used in pharmacy have been augmented, both in number and in kind. This new theory of pharmacology, based firmly upon scattered statements from a wide range of Galenic writings, can be nicely illustrated with the lengthy prologue by Aetius of Amida to his *Medical Books* (the *Tetrabiblon*).[1] Moreover, when one compares "borrowing" by Oribasius, Aetius, Alexander, and Paul, from Galen and earlier authorities, one discerns significant variations in syntax and, most importantly, a clear consideration of medicinal substances in their own right, rather far removed from the copyist epithet often given to these early Byzantine medical writers. Oribasius and Alexander, in particular, submit drug recipes that show a command of the ancient texts and personal experience with pharmaceuticals.

We are also fortunate in being able to link the allegedly formal aspects of early Byzantine drug lore with data that the non-physician might know—at least in late Roman and Byzantine Egypt. Many papyri, especially those contained in the collection called the *Papyri Graeci Magicae*,[2] show how drugs and pharmaceuticals were used in numerous non-medical contexts, but of great importance among these papyrological citations is the assumption of common knowledge of the *kyphi* and *krisma* recipes, also significant in the formal works by Byzantine physicians on pharmacology. Early Byzantine pharmacy drew upon classical heritages—from the Hippocratics through Galen—but it also shows a clear development of its own, seen best in a reworked drug theory and in the augmentation of particular substances employed as pharmaceuticals. This sophisticated pharmacy is also paralleled in the papyri,[3] but these documents are, of course, shorn of theory, which may or may not have penetrated into the ranks of Egyptian priests, soothsayers, and purported experts in magic.[4]

THE HISTORICAL BACKGROUND OF GREEK AND ROMAN PHARMACY TO GALEN

Drug lore is the first aspect of Greek medicine that can be documented, since spices and presumed pharmaceuticals turn up in the Linear B tablets of Mycenaean Greece and Crete.[5] After the

[The reader is referred to the list of abbreviations at the end of the volume.]

[1] Aetius I *prooemium* (ed. Olivieri [*CMG* VIII 1], pp. 17–30).

[2] See esp. *PGM*, IV, 2307–9; XII, 401–45; XXXVI, 322–32.

[3] Marie-Hélène Marganne, *Inventaire analytique des papyrus grecs de médecine* (Geneva, 1981). Magical papyri are excluded.

[4] E.g., *PGM*, XII, 401–45. Cf. H. Harrauer and P. J. Sijpestein, *Medizinische Rezepte und Verwandtes* (Vienna, 1981); K. Sudhoff, *Ärztliches aus griechischen Papyrus-Urkunden* (Leipzig, 1909); H. I. Bell, A. D. Nock, and H. Thompson, *Magical Texts from a Bilingual Papyrus in the British Museum* (London, 1931 [Proceedings of the British Academy, Vol. XVII]). Unfortunately, the rich lore and medical equivalencies in E. A. E. Reymond, *From the Contents of the Libraries of the Suchos Temples in the Fayyum*, Part I: *A Medical Book from Crocodilopolis P. Vindob. D. 6257* (Vienna, 1976), cannot be trusted. A new edition with translation and commentary of P. Vindobonensis D. 6257 is in preparation at the Oriental Institute of the University of Chicago.

[5] See esp. L. R. Palmer, *Interpretation of Mycenaean Greek Texts* (Oxford, 1963), Nos. 163–168 [pp. 269–73], and J. Chadwick, *Documents in Mycenaean Greek*, 2nd ed. (Cambridge, 1973), Nos.

passing of the Mycenaeans, there is good indication of a common knowledge of *pharmaka* (at least those that were involved in application of simples for minor wounds, and those that were deemed potent in spells and incantations) in Homer's epics,[6] so that drug lore probably flourished among the Greeks of the Homeric Age, much as it would later.[7] Lyric poetry has left us with some isolated mentions of drugs and salves,[8] and there is firm evidence that certain drugs were well known among the Greeks in the fifth century B.C., suggested by puns in Aristophanes and other non-medical writers.[9] It is not until the fifth and fourth centuries B.C. that a separate study of medical plants was made a part of formal medical practice, and the Pseudo-Aristotelian *Problems* probably mirror the same sources for drugs and drug theory that appear also in several books of the Hippocratic *corpus*.[10] Diocles of Carystos (a contemporary of Aristotle)[11] studied plants for their pharmaceutical properties, and the study of botany received a canonical form in Theophrastus' *Historia plantarum* and *De causis plantarum* (both c. 300 B.C.);[12] Book IX of *Historia plantarum* is our first extant herbal in Greek.[13] Theophrastus carefully classifies plants by their leaves, roots, seeds, stems, and growing season, and the methodologies of his master, Aristotle, show brilliantly in the taxonomy and morphology.[14]

Although there is good evidence for the study of pharmacy in the Hellenistic era, our available texts for the period consist of fragmentary remains of the drug lore of Apollodorus (*fl.* c. 250 B.C.),[15] and such notables as Herophilus and Erasistratus (both *fl.* 270–260 B.C.),[16] as well as the two poems on toxicology by Nicander of Colophon (*fl.* c. 130 B.C.) called *Theriaca* and *Alexipharmaca*.[17] Nicander stole his data from the lost works of Apollodorus, who had made a detailed study of toxic substances, poisonous snakes, scorpions, spiders, and insects,[18] apparently in the manner of Peripatetic natural history,[19] but it would be Nicander's obtuse poems that became standard "textbooks" in toxicology, employed by almost all medical authorities from his own time through the European Renaissance.[20]

Theophrastus struggled with the problem of how drugs were to be classified, and he provides an extremely muddled system in *Historia plantarum* IX.[21] Much of his data is derived from a professional class of *rhizotomoi*, whose firsthand experience Theophrastus records in several instances.[22] Yet the definition of *poa* ("herb") remains hopelessly vague, since Theophrastus' overriding methodology demanded first attention to morphology and taxonomy, not to the medical properties of any particular plant or drug made from a plant. A foggy notion

103, 105, and 107 [pp. 224, 228, and 231]. A few, scattered studies have begun to appear on these texts and similar ones, e.g., Anna Sacconi, "La mirra nella preparazione degli unguenti profumati a Cnosso," *Athenaeum*, n.s. 47 (1969), 281–89; C. P. W. Warren, "Some Aspects of Medicine in the Greek Bronze Age," *Medical History*, 14 (1970), 364–77; and R. Janko, "Un 1314: Herbal Remedies at Pylos," *Minos*, 17 (1981), 30–34.

6 E.g., Homer, *Odyssey* X, 304–6, 316–17, and 391–94, among many references.

7 Cf. Homer, *Iliad* VIII, 306–8, with Dioscorides IV, 64.1 (ed. Wellmann, II, p. 218).

8 When Sappho, Frg. 96 (var. eds., trans. D. A. Campbell, *Greek Lyric*, I [Cambridge, Mass., 1982], p. 120 [Loeb]), writes "the dew is shed in beauty, and roses bloom and tender chervil and flowery melilot," one immediately perceives a long-lived close acquaintance with herbs and flowers. Sappho, Frgs. 105, 143, 189, and 210 (Campbell, pp. 132, 156, 180 and 192) mention hyacinth, chick peas, nitrum, and fustic. Cf. Theognis 537 and 1193 (squill and spiny broom); Simonides 10 (myrtle); Hesiod, *Works* 41 (asphodel), etc., among many references.

9 E.g., Aristophanes, *Lysistrata* 89, and *Peace* 712 (puns on the uses of the pennyroyal [*Mentha pulegium* L.]). Discussion in Scarborough, "Nicander II," 74–75 with nn. 239–54.

10 J. Scarborough, "Theoretical Assumptions in Hippocratic Pharmacology," in F. Lasserre and P. Mudry, eds., *Formes de pensée dans la collection hippocratique: Actes du IVe Colloque international hippocratique (Lausanne . . . 1981)* (Geneva, 1983), 307–25.

11 W. Jaeger, *Diokles von Karystos*, 2nd ed. (Berlin, 1963), 186–236. The fairly extensive fragments of Diocles' writings are collected in M. Wellmann, ed., *Die Fragmente der sikelischen Ärzte Akron, Philistion und des Diokles von Karystos* (Berlin, 1901), 117–207.

12 F. Egerton, ed., *Edward Lee Greene: Landmarks of Botanical History* (Stanford, California, 1983; 2 vols.), I, 128–211.

13 J. Scarborough, "Theophrastus on Herbals and Herbal Remedies," *JHB*, 11 (1978), 353–85.

14 Egerton, ed., *Greene* (n. 12 above), I, 169–89. O. Regenbogen, "Theophrastos," *RE*, Supplementband VII (Stuttgart, 1940), cols. 1354–1562, esp. 1435–79 (botany).

15 M. Wellmann, "Apollodorus (69)," *RE*, Vol. I, part 2 (Stuttgart, 1894), col. 2895, and (same author), "Das älteste Kräuterbuch der Griechen," in *Festgabe für Franz Susemihl* (Leipzig, 1898), 1–31. J. Scarborough, "Nicander's Toxicology, I: Snakes," *PH*, 19 (1977), 3–23 (3–4, with nn. 8–19).

16 P. M. Fraser, *Ptolemaic Alexandria* (Oxford, 1972; 3 vols.), I, 353, and II, 519 n. 116, and 627 n. 472 [Herophilus]. R. Fuchs, "Eine neue Receptformel des Erasistratos," *Hermes*, 33 (1898), 342–44.

17 Nicander (ed. and trans. Gow and Scholfield) is the best edition available, with a translation quite often based on shrewd guesswork—openly admitted by the editors.

18 Scarborough, "Nicander's Snakes" (n. 15 above), 3–4, and (same author), "Nicander II" *passim*.

19 Scarborough, "Nicander II," 5–6. Wellmann, "Kräuterbuch" (n. 15 above), 28.

20 E.g., a late Greek manuscript (Bologna, Bibl. Univ. Codex 3632, esp. fol. 417) of the late fifteenth or early sixteenth century. Scarborough, "Nicander II," 4, with nn. 4–8.

21 Egerton, ed., *Greene* (n. 12 above), I, 180–81. Scarborough, "Theophrastus" (n. 13 above), 356–57.

22 Theophrastus, *HP* IX, 8 *passim*; 11.7 and 9; 15.2; 16.3; 18.3 and 10; and 20.4.

of toxicology does appear in Book IX of *Historia plantarum*,[23] but Theophrastus and his sources seem unaware of a basic theory that would explain the differences among drugs. Some hints of an embryonic theory of toxicology do, indeed, appear in the Pseudo-Aristotelian *Problems*, as well as certain tracts of the Hippocratic *corpus*, but there is more of an attempt to collect data than to propose a logical and careful hypothesis about how and why drugs "work" as they do. Nicander's poems also reflect this attention to the collection of details, and the lack of a cohesive theory to link them together, and the fragments of other Hellenistic pharmacologists likewise suggest a haphazard and often erroneous set of prescriptions, or—in the cases of Herophilus and Erasistratus—an attempt to set down specific treatments for particular ailments, in the classic manner of the Hippocratic writers.

Dioscorides of Anazarbus (*fl.* c. A.D. 65) attempted to change the chaos of pharmacology into an ordered system.[24] He seems to have invented a "drug affinity" methodology for the study of pharmaceuticals, quite similar to the modern concepts underlying pharmacognosy, but this non-alphabetical, non-humoral theory demanded precise observation of plants in their varying growing seasons as well as extreme accuracy in the physician's observations concerning which drugs were useful against which specific ailments and diseases. Dioscorides' *Materia medica* certainly became a classic handbook, quoted by almost all later writers on pharmacy (both Greek and Latin, as well as Arabic) for nearly 1800 years.[25] He includes nearly 600 species of plants in the *Materia medica*,[26] compared with approximately 450 species in the Hippocratic *corpus*,[27] the 550 species recorded by Theophrastus,[28] and the 300 plant names given by Nicander.[29] Dioscorides' listings encompass many drugs introduced into Greco-Roman pharmacy from the Far East,[30] showing the expansion of trade and geographic knowledge in the Hellenistic era and in the first decades of Roman imperial rule in the eastern Mediterranean.[31] His rejection, however, of both the poetic form of relating knowledge of drugs (illustrated by the difficult hexameters of Nicander) and also the apparently standard manner of listing simples in alphabetical order,[32] led in turn to the discarding of Dioscorides' classification system by later pharmacologists, including the chalcenteric Galen.[33] Dioscorides' drug lore tapped not only the formal sources of pharmacology, as they might be found in earlier written records, but also folk medicine, acknowledged from time to time in the *Materia medica*.[34] Moreover, he insists that the would-be pharmacologist has to know his plants, not from book-learning, but by patient and lengthy observation of herb growth as they changed form, shape, and color through differing seasons in various geographic locations as he knew them generally in the eastern Mediterranean litoral.[35] Added to the demand of painstaking observation of reaction to drugs by actual patients, these two requirements by Dioscorides soon led to modifications, including a return to alphabetical listings and pharmaceutical poetry.[36] While respecting Dioscorides for his obvious learning and meticulous attention to botanical details, Galen rejected the "drug affinity" system, while retaining (at least he says he does) Dioscorides' admonition to know the plants from personal experience. And it would be Galen, not Dioscorides, who would provide the beginning models for Byzantine drug lore.

Galen's Pharmacy

Galen of Pergamon (A.D. 129-prob. 210) looms as one of the most influential writers in the entire history of medicine.[37] His summary of all aspects

[23] Theophrastus, *HP* IX, 16.4–7. Scarborough, "Theophrastus" (n. 13 above), 376–77 with nn. 131–35.

[24] Scarborough and Nutton, "Preface," 189–90. J. M. Riddle, "Dioscorides," *DSB*, Vol. IV (New York, 1971), 119–23. Riddle's *Dioscorides* (Austin, Texas [in press]) explicates in brilliant detail Dioscorides' "drug affinity" system.

[25] J. M. Riddle, "Dioscorides" in *Catalogus* IV, 1–143. Scarborough and Nutton, "Preface," 187–88.

[26] J. Stannard, "Byzantine Botanical Lexicography," *Episteme*, 5 (1971), 168–87 [171].

[27] My "count" differs sharply with that of Stannard (*ibid.*), who suggests about 225 spp. [p. 170].

[28] Regenbogen, "Theophrastos" (n. 14 above), col. 1467. Egerton, ed., *Greene* (n. 12 above), I, 96 gives 500 as his "count."

[29] Based on Nicander, ed. and trans. Gow and Scholfield.

[30] E.g., ginger (*Zingiber officinale* Roscoe) among several. J. I. Miller, *The Spice Trade of the Roman Empire* (Oxford, 1969), 53–57.

[31] J. Scarborough, "Roman Pharmacy and the Eastern Drug Trade," *PH*, 24 (1982), 135–43.

[32] Scarborough and Nutton, "Preface," 212–13.

[33] *Ibid.*, 190–91.

[34] *Ibid.*, 189 with nn. 10 and 13.

[35] Dioscorides, *Preface* 7 (ed. Wellmann, I, p. 4; trans. Scarborough and Nutton, "Preface," 196–97).

[36] E.g. the medical poetry of Damocrates (quoted by Galen) and most of the drug lists by Galen.

[37] The literature on Galen is enormous, but only a few works are based securely on the Greek texts. Recommended are: V. Nutton, "The Chronology of Galen's Early Career," *CQ*, n.s. 23 (1973), 158–71, and [same author], "Galen and Medical Auto-

of medicine and related matters, including philosophy and pharmacology, exerted a heavy sway over physicians and medical commentators well into the nineteenth century,[38] and one may gauge his prolixity and learning by the simple task of counting the volumes (20) represented by the Kühn edition of Galen.[39] Since his drug lore influenced later writers, especially in the Byzantine East, so heavily, one necessarily must consider Galen's pharmacology in some detail in order to perceive how early Byzantine drug theory might be similar to and different from the presumed blueprints laid down in several of his treatises which consider pharmaceuticals in particular.

Galen's drug lore is scattered throughout the massive number of works left under his name, but much of his approach to pharmacology, herbs, and treatments through pharmaceuticals is concentrated in *Mixtures and Properties of Simples*,[40] *Compound Drugs Arranged by Location of Ailment*,[41] *Compound Drugs Arranged by Kind*,[42] *Antidotes*,[43] and similar tracts, some of which may be spurious.[44] Galen quotes from dozens of earlier Greek and Roman pharmacologists—including Dioscorides—and although Galen insists one had to know plants and drugs personally,[45] many of the recipes, prescriptions, and treatments are filched from earlier authorities,[46] most often through previous collections of recipes compiled by Andromachus (physician to Nero [A.D. 54–68]), Asclepiades the Pharmacist (prob. *fl.* c. A.D. 50), and Criton (physician to Trajan [A.D. 98–117]). He includes all of the famous simples, known from the time of Theophrastus, but adds no new herbs to the varieties already known to Dioscorides.

In *Mixtures and Properties of Simples* I–V,[47] Galen sets out in an incredibly verbose fashion his composite theory of drug action, based upon degree of cold and hot, moist and dry, with subtle subclassifications generally measured according to the senses of taste, touch, and smell. Not surprisingly, these 329 Kühn pages will not form the foundation of Byzantine adaptation of Galen's drug theories, as will be suggested below with the consideration of the Preface to Aetius' *Medical Books*. Galen proposes his arguments upon what he says are the "best authorities," and *Simples* I–V is replete with name-dropping of the worthies of the pharmaceutical past, from Diocles, Hippocrates, and Theophrastus, through Dioscorides and Asclepiades. What emerges in this involuted summary is the famous "drugs by degrees" system,[48] which would retain its hold on western pharmacy until the nineteenth century. Only in the beginning of Book VI of *Simples* does Galen speak in specific about drugs, and then only after a Preface to Book VI in which he warns against misleading authorities (for example, Pamphilus)[49] who were not experts in plants, and in which he re-lists the reliable sources (a long list that includes Dioscorides)[50]—but Galen lets us know that none of his predecessors understood drugs as well as he does. Then follows the listing of drugs, beginning with "On Shrubby Wormwood and Absinthe and their Particular Kinds."[51] Unlike the extreme clarity of Dioscorides, we read a muddled catalogue of properties generally based on locale. *Simples* VI, 2[52] is "On Agnus Castus," *Simples* VI, 3 is "On Dog's Tooth Grass" [*agrōstis*],[53] VI, 4 is "The Four Kinds of Alkanet" [*anchousa*],[54] VI, 5 is "The Agaric 'Root'"

biography," *Proceedings of the Cambridge Philological Society*, 18 (1972), 50–62; J. Scarborough, "The Galenic Question," *SA*, 65 (1981), 1–31, and (same author), "Galen and the Gladiators," *Episteme*, 5 (1971), 98–111; J. Ilberg, "Aus Galens Praxis," *Neue Jahrbücher für das klassische Altertum*, 15 (1905), 276–312 (rptd. in H. Flashar, ed., *Antike Medizin* [Darmstadt, 1971], 361–416); J. Mewaldt, "Galenos (2)," *RE*, Vol. VII, part 1 (Stuttgart, 1910), cols. 578–91; F. Kudlien and L. G. Wilson, "Galen," *DSB*, Vol. V (New York, 1972), 227–37; W. D. Smith, *The Hippocratic Tradition* (Ithaca, New York, 1979), 61–176; J. Kollesch, "Galen und die Zweite Sophistik," in Nutton, ed., *Galen: Problems*, 1–12; and—above all—Temkin, *Galenism*, 10–50 ("The Portrait of an Ideal").

38 Temkin, *Galenism*, 134–92 ("Fall and Afterlife").

39 The texts of Galen in *CMG* are a small proportion of the works contained in the Kühn ed., which is badly marred by corruptions. To the listing in H. Leitner, *Bibliography to the Ancient Medical Authors* (Bern, 1973), 38–39, can now be added: Nutton, ed., *Galen On Prognosis*; and De Lacy, ed., *Galen On the Doctrines of Hippocrates and Plato*.

40 Ed. Kühn, XI, 379–892, and XII, 1–377 (in 11 books).

41 Ed. Kühn, XII, 378–1007, and XIII, 1–361 (in 10 books).

42 Ed. Kühn, XIII, 362–1058 (in 7 books).

43 Ed. Kühn, XIV, 1–209 (in 2 books)

44 *Theriac to Piso* (ed. Kühn, XIV, 210–94 [possible]), *Theriac to Pamphilus* (ed. Kühn, XIV, 295–310 [certainly spurious]), *Easily-Obtained Drugs* (ed. Kühn, XIV, 311–581 in 3 books [certainly spurious]).

45 Galen, *Mixtures and Properties of Simples* VI, preface (ed. Kühn, XI, 797). Scarborough, *Medicine*, 128–30.

46 Fabricius, 62–100.

47 Ed. Kühn, XI, 459–788.

48 See discussion of Aetius with nn. 149–68 below.

49 Ed. Kühn, XI, 793–94.

50 *Ibid.*, 794 and 797.

51 *Simples* VI, 1 (ed. Kühn, XI, 798–807). Scarborough and Nutton, "Preface," 225–27 (wormwoods).

52 Cf. Dioscorides I, 103. This is *Vitex agnus-castus* L. (ed. Kühn, XI, 807–10).

53 Scarborough and Nutton, "Preface," 219 (dog's tooth grass: *Cynodon dactylon* [L.] Pers.). ed. Kühn, XI, 810–11.

54 Ed. Kühn, XI, 811–13. Cf. Dioscorides IV, 23. This is *Anchousa tinctoria* L.

[*agarikos*],[55] and so on, so that by the end of Book VI of *Simples*, Galen has reached *iota* in what has become an alphabetical listing of simples (all plants) with some properties given according to "heating" and "cooling." Books VII and VIII[56] complete the alphabetical listing of herbs and their properties by their classes of heating and cooling qualities. *Simples* IX, 1.1–4 is "Earths,"[57] IX, 2.1–21 "Stones,"[58] and "Things Mined as Drugs" [*metallika pharmaka*] is *Simples* IX, 3.1–40.[59] Most of these substances are in alphabetical order, with some exceptions suggesting possible corruptions in the Greek texts. *Simples* X is what we would call "animal products," and much as had Dioscorides often prescribed blood for various ailments, so too does Galen extrapolate on this "humor" as a drug along with a number of other materials presumably classed with blood because they emerge from animals; the listing in and of itself is instructive, not so much for what Galen recommended, but for the substances he found listed in his sources (Xenocrates seems to be a major authority).[60] After listing various animal bloods (dove, bat, rabbit, deer, rooster, male goat, lamb, bear, bull, green frog, crocodile and lizard),[61] one reaches a "dairy product" listing (milk, cheese, butter, rennet, seal rennet),[62] followed by biles, perspiration, urine, saliva, and various kinds of animal and bird dungs and manure.[63]

In Book XI of *Simples*, Galen lists other "animal products,"[64] ranging from the flesh of poisonous snakes, marrow, and the liver of a mad dog,[65] to spider webs, blister beetles, cicadas, castor, brains of various animals, eggs, and charred crabs.[66] *Simples* XI, 2 is a collection of oddments that could be labeled "products of the sea useful in medicinals,"[67] and here are sponges, garum, coral, various sorts of salts and salt products including *asphaltos*.[68] Unlike the herbs and plants of *Simples* VI–VIII, which are given alphabetically, Galen's animal products and sea-medicines seem entered according to another pattern, perhaps ultimately derived from Dioscorides or earlier data found in some of the Hippocratic texts. In sum, Galen lists about 440 different plants in his accounting of herbs in *Simples* I–VIII, and about 250 other substances in the remaining books as useful in making drugs. Indeed, there are caustic remarks concerning the drugs of Xenocrates, especially the varieties of dung, but Galen *does* list them, and one can presume that such materials had long standing in ancient pharmacology, verified by a comparison with medicinals suggested by writers in the Hippocratic *corpus*, Dioscorides, as well as the magical papyri.[69]

Once the alphabetical and non-alphabetical listings of drugs are completed in *Simples*, Galen apparently decides to approach pharmaceutical lore in another way in the ten books we have as *Compound Drugs Arranged by Location of Ailment*.[70] These ten books were written after Galen had put down the *Method of Healing*,[71] whereas the *Simples* predates it.[72] Galen's struggle with drugs—and how to classify them—can be discerned through the successive attempts he made to provide lucid catalogues: first is his *Properties of Cleansing Drugs*, writ-

[55] Ed. Kühn, XI, 813–14. As this is a shelf-fungus, the passage shows Galen's ignorance. G. Maggiulli, *Nomenclatura micologica latina* (Genoa, 1977), 85–87. Cf. Dioscorides III, 1.

[56] Ed. Kühn, XII, 1–158.

[57] *Ibid.*, 165–92.

[58] *Ibid.*, 192–208.

[59] *Ibid.*, 208–44.

[60] *Simples* X, preface (ed. Kühn, XII, 245–53).

[61] *Simples* X, 2–6 (ed. Kühn, XII, 256–63).

[62] *Simples* X, 2.7–12 (ed. Kühn, XII, 263–75).

[63] *Simples* X, 2.13–29 (ed. Kühn, XII, 275–308). *Simples* X, 2.15 (ed. Kühn, XII, 284–88) ends with Galen noting that "drinking the urine of a prepubescent boy is not recommended," and *Simples* X, 2.16 (ed. Kühn, XII, 288–90: on salivas) has a rare direct quotation from Nicander (*Theriaca* 86). *Simples* X, 2.17 (ed. Kühn, XII, 290) summarizes why one uses such materials. Cf. Paul of Aegina VII, 3, *s.v.* κόπρος (ed. Heiberg, II, 228).

[64] Ed. Kühn, XII, 310–77.

[65] *Simples* XI, 1.1 (snakes, esp. the *echidnē*: Scarborough, "Nicander's Snakes" [n. 15 above], 7–8); XI, 1.3 (marrow); and XI, 1.10 (rabid dog's liver). ed. Kühn, XII, 311–23, 311–33, and 335.

[66] *Simples* XI, 1.23 (spider webs); XI, 1.44–45 (blister beetles); XI, 1.36 (cicadas); XI, 1.15 (castor); and XI, 1.31 (brains, kidneys, and eggs). Ed. Kühn, XII, 343, 363–64, 360, 337–41, and 349–55. Charred or burned crabs, or more accurately the ashes of crabs, are prescribed in *Simples* XI, 1.24 (ed. Kühn, XII, 356–59). J. Scarborough, "Some Beetles in Pliny's Natural History," *Coleopterists Bulletin*, 31 (1977), 293–96 ("Spanish Fly" and beetles of Lyttinae) and (same author), "Nicander II," 13–14, 20–21, 73–80 with nn. 134–45, 215–30, and 237–325 (blister beetles, descriptions, and purported remedies for the ingestion of "Spanish Fly" in classical antiquity); and (same author), "The Drug Lore of Asclepiades of Bithynia," *PH*, 17 (1975), 43–57 (51: castor).

[67] Ed. Kühn, XII, 369–77.

[68] *Simples* XI, 2.11 (sponges); XI, 2.12 (garum); XI, 2.3 (coral); and XI, 2.5–10 (salts and salt products). Ed. Kühn, XII, 376, 377, 370–71, and 372–75. For garum, see R. I. Curtis, "In Defense of *Garum*," *CJ*, 78 (1983), 232–40, and [same author] "The Garum Shop of Pompeii," *Cronache Pompeiane*, 5 (1979), 5–23. For sponges, see J. Théodoridès, "Considerations on the Medical Use of Marine Invertebrates," in M. Sears and D. Merriman, eds., *Oceanography: The Past* (New York, 1980), 734–49 (esp. 734–36).

[69] Cf. *PGM*, I, 224–25; IV, 1439–40, 2574–75, 2585, 2651; VII, 486; XII, 410, 414.

[70] Ed. Kühn, XII, 378–1007, and XIII, 1–361.

[71] *Drugs by Location* I, 1 (ed. Kühn, XII, 378).

[72] Ilberg, *Schriftstellerei*, 89.

ten before A.D. 169;[73] then Galen wrote the second of his "drug books," *Simples*, probably in the 170s, number six on the list of the works as suggested by Ilberg, after Galen's return to Rome in 169;[74] *Location* was written sometime in the period between A.D. 180 and 193, preceded by *Compound Drugs Arranged by Kind*.[75] Even though Ilberg shows that *Drugs by Kind* was composed before *Drugs by Location*, the Kühn edition places *Location* previous to *By Kind*, so that the following synopsis proceeds according to the unfortunately erroneous order (which has become traditional) set down in the Kühn volumes. Both *Drugs by Location* and *Drugs by Kind* indicate Galen's continual efforts to obtain clarity in description of medicinals, and Ilberg rightly notes that these two collections of drug lore came from Galen's pen very close to one another in time, perhaps in the two or three years preceding the fire in the Temple of Peace in A.D. 192.[76]

The arrangement of drugs in *Location*, so Galen writes,[77] is inspired by the example of Hippocrates, and would seem to show an order of the simplest sort: a beginning with affections of the head would lead, naturally enough, to ailments to be treated as one proceeds down from the head through other parts of the body (each with its own malfunctions: *tou kamnontos krasis hē te tou paschontos moriou physis*[78]), a manner called in the later Latin tradition, *a capite ad calcem*. What follows in *Drugs by Location* is a series of suggestions for various problems, indicative more of an "upper class" practice and a culling of beauty-care manuals than of Galen's original intent to organize drug lore in a logical head-to-toe pattern. Titles of the sections delineate the subject matter of *Drugs by Location*, almost in contradistinction to what Galen has said he wants to do in the short preface: "Alopecia," "On Hair Loss," "On the Coloring of Hair," "Drugs for Broken Hair," "Thin Hair," "On Hair that is Dying," and "Dandruff."[79] Much of this material comes from quoted extracts of Criton's books on drugs,[80] in turn extracting earlier sources on pharmaceuticals under the names of Archigenes, Cleopatra, and Apollonius.[81] Book II of *Drugs by Location* has recipes from a number of sources on "illnesses of the head,"[82] but most of the prescriptions for ear and nose problems are in Book III,[83] and the list of "authorities" has expanded to include Damocrates (recipes in poetry), Heras, Apollonius, Archigenes, Andromachus, Xenocrates, Harpalus, Harpocrates, Solon the Dietician, Zoilus the Ophthalmologist, Asclepiades, Charixenus, Antonius Musa, Heraclides of Tarentum, etc.[84] Eye diseases and numerous *kollyria* recipes comprise *Location* IV,[85] and more "beauty aids" for eye-bruises and black eyes begin *Location* V,[86] followed by lachrymal fistulas,[87] and salves, ointments, and plasters for the forehead, along with a great number of mouthwashes, dentifrices (Damocrates' poems) and treatments for various tooth problems.[88] Stomach soothers and gargles form Book VI,[89] congestion relievers and arteriaces are Book VII,[90] but *Drugs by Location* IX contains a melange of remedies, including internal treatments for jaundices and affections of the spleen, followed by hemorrhoids, priapism, anal suppositories, and finally a recipe for the treatment of "uterine suffocation."[91] Book X provides recipes for the treatment of kidney problems, gout, sciatica (*ischias*), and arthritis,[92] and at one point where a poem of Damocrates is being quoted for a cure of sciatica, there is clear indication that an illustrated text has been consulted.[93] *Compound Drugs Arranged by Location of Ailment* does not emerge as a complete and coherent tract on drug lore, but seems to be a potpourri of recipes collected and loosely grouped by external parts, emphasizing the head, with sections on gout, sciatica, and the like that might formally qualify the work as a "head-to-toe" treatise.

The third of Galen's massive pharmaceutical

[73] Ed. Kühn, XI, 323–42. Ilberg, *Schriftstellerei*, 77.
[74] Ilberg, *Schriftstellerei*, 89.
[75] *Ibid.*, 20–23 and 84.
[76] *Ibid.*, 84.
[77] *Drugs by Location* I, 1 (ed. Kühn, XII, 381).
[78] *Ibid.* (ed. Kühn, XII, 378).
[79] *Drugs by Location* I, 2–9 (ed. Kühn, XII, 381–497).
[80] On Criton, physician to Trajan (A.D. 98–117), see E. Kind, "Kriton (7)," *RE*, Vol. XI, part 2 (Stuttgart, 1922), cols. 1935–38, and J. Benedum, "Kriton," *RE*, Supplementband XIV (Stuttgart, 1974), cols. 216–20.
[81] Fabricius, 198–99 (Archigenes), 180–83 (Apollonius).
[82] Ed. Kühn, XII, 498–598.
[83] *Ibid.*, 599–695.
[84] Fabricius, 189–90 (Damocrates), 183–85 (Heras), 180–83 (Apollonius), 198–99 (Archigenes), 185–89 (Andromachus the Younger), etc. M. Wellmann, "Beiträge zur Quellenanalyse des Älteren Plinius," *Hermes*, 59 (1924), 129–56 (140–42; Xenocrates; 142–43: Solon).
[85] Ed. Kühn, XII, 696–803.
[86] *Ibid.*, 804–93.
[87] *Ibid.*, 820–22.
[88] *Ibid.*, 889–93 (Damocrates' poems).
[89] Ed. Kühn, XII, 894–1007.
[90] Ed. Kühn, XIII, 1–115.
[91] *Ibid.*, 228–320. "Uterine Suffocation": *Location* IX, 10 (ed. Kühn, XIII, 319–20). Cf. *PGM*, VII, 260–71, and Soranus, *Gynecology* III, 50 (ed. Ilberg, pp. 127–28).
[92] Ed. Kühn, XIII, 321–61.
[93] *Ibid.*, 351.

works is titled *Compound Drugs Arranged by Kind.*[94] It seems that Galen had been attacked by other physicians for his earlier writings on drugs,[95] which had omissions and faulty principles of organization; it also seems apparent that he wrote *Drugs by Kind* late in life, after the fire at the Temple of Peace in A.D. 192.[96] He will stick by his "system of degrees" as developed in the *Simples*, but he has shifted somewhat as he begins to write this "third approach" to drugs, taking up the venerated "treatment by contraries."[97] What follows in the seven books of *Drugs by Kind* is compilation accompanied by commentary, interspersed by recipes, and the remedies "work" according to the theory of treatment by contraries. An odd sort of fuzziness characterizes the initial chapters of *Drugs by Kind* I, but there is a greater care with sources than one finds in Galen's earlier treatises on pharmacy, illustrated by the subtitles: "A White [Plaster] from [White] Pepper, as Compounded by Attalus and Heras," followed by "Attalus, as Quoted by Andromachus, on the Compounding of a White [Plaster] for a Small Wound by a Rabid [Dog] and for Wounded *Neura*."[98] Heras was an authority on rabies,[99] but Galen is concentrating his attention in Book I of *By Kind* on the white color of the plasters under discussion, and he ends the book with a quotation from Damocrates' medical poem, "On the White Plaster."[100] Green plasters occupy Galen in *By Kind* II, 2–4 (Kühn, XIII, 470–99), but *By Kind* II, 3 (Kühn, XIII, 496) shows that Galen is *not* arguing that the similarities of color give certain "related" plasters their effectiveness, but that their similarity of properties (*dynameis*) provide their usefulness—even though he condemns Andromachus for taking color as a guide. *By Kind* II, 5 (Kühn, XIII, 499–503) is "Drugs That Can be Wiped Away Quickly," and here are salves and oily ointments as cited (without specific recipes) from Criton, Heras, Archigenes, Philip, Menecrates, and other authorities. *By Kind* II–IV contain a large number of suggestions on plasters, drugs for wounds of the *neura*, and drugs for promoting the healing of wounds and ulcerations, as well as plasters and ointments that helped form scar tissue (cicatrization), culled from a number of sources.[101] Book V of *By Kind* (Kühn, XIII, 763–858) might be titled "Multi-Purpose Drugs," and Galen gives a dazzling display of his purported knowledge of pharmaceuticals—or at least his command of the written sources that have recorded such multiple-use drugs. In *By Kind* V, 1 (Kühn, XIII, 763–65), Galen restates his basic, underlying theory of drugs by describing them all, in the first place, as characterized by the hot, the cold, the dry, and the wet, and then, consequently, considering the compounding from simples of these drugs according to their dominant quality; this, in turn, would indicate how these compound medicinals would perform according to their "thinning" properties, "thickening" properties, "promotion of scarring" properties, induction of flesh-growth properties, and so on. Only in this way, Galen insists, can one comprehend why drugs work as they do. Formulas abound. Authorities appear in a rapid blur, and the list of names cited in Book V of *By Kind* indicates which sources Galen had at his disposal, and will provide part of the pattern through which Byzantine medical writers would use *their* sources—whether through Galen or independently.[102]

Book VI of Galen's *Compound Drugs Arranged by Kind* (Kühn, XIII, 859–945) takes up the subject of multi-use plasters. First comes a "Preface" (*By Kind* VI, 1 [Kühn, XIII, 859–62]) in which Galen notes that the previous book of *By Kind* has considered the plasters called *poluchrēstoi*, designated as

[94] Ed. Kühn, XIII, 362–1058 (in 7 books).

[95] *By Kind* I, 1 (ed. Kühn, XIII, 363).

[96] *By Kind* I, 1 (ed. Kühn, XIII, 362).

[97] *By Kind* I, 1 (ed. Kühn, XIII, 367).

[98] *By Kind* I, 13–14 (ed. Kühn, XIII, 414–27).

[99] *By Kind* I, 16 (ed. Kühn, XIII, 431–42: Heras on hydrophobia, accompanied by Xenocrates).

[100] *By Kind* I, 19 (ed. Kühn, XIII, 455–57).

[101] Ed. Kühn, XIII, 503–762.

[102] Heras of Cappadocia, Epigonus, "from the Temple of Hephaestus at Memphis" (a plaster made from dittany [Kühn, XIII, 778–80]), Hicesius, Criton quoting Heras, Criton quoting Hicesius, Andromachus, Criton quoting the recipe of the "Medicine of Machairon" for the healing of all kinds of wound (Kühn, XIII, 796–97), Criton quoting Damocrates, Asclepiades (*By Kind* V, 4 [Kühn, XIII, 801–2] along with a recipe compounded by Galen), Phylacus quoting Diophantus the surgeon, Andromachus on green plasters (quoting Evagrius, Epicurus, Alcimonius or Nicomachus), Heraclides of Tarentum quoting Hicesius, Philoxenus, Damocrates' poem on making a plaster from dittany (*By Kind* V, 10 [Kühn, XIII, 820–23]), Asclepiades quoting Aristarchus of Tarsus (V, 11 [Kühn, XIII, 824–25]), Andronius, Terentius, Areius, [Scribonius] Largus (Kühn, XIII, 828), Threptus, Hierax of Thebes, Lucius, Magnus of Philadelphia, Gaius of Naples, Agathinus, Mnesitheus, Apollophanes. Nicolaus, Petronius, Agathocles, Achilla (Kühn, XIII, 834), Isidorus, Alcimion quoting Apollonius Archistrator on the "pill that acts like a scalpel" (Kühn, XIII, 835), Glaucius, Tiberius Caesar, Phanius, Antipatrus, Publius, Philinus, Melitonus, Apollonius of Tarsus, Asclepiades quoting Marcellus, Xenocrates from his work *Drugs from Vetch* (Kühn, XIII, 846), a recipe of Serapis "set up on metal plates: a fleshmaker" (Kühn, XIII, 847), Tryphon, Heliodorus, Ptolemy, Eunomus, Theotropus quoting Areius, Apelles, and Cleobulus. Galen has gained most of these names and recipes through the collections of Andromachus, Asclepiades, and Criton.

those preparations to be "laid on" for treatment of open sores, ulcers, and the like, either to cause them to heal rapidly, or to cause them to remain open, according to the course of therapy prescribed by the physician. Galen says he has observed the compounding of such drugs during his frequent travels, and how he will, now, record some further "wide-use" plasters, but only after he has verified their efficacy in his own experience with patients. These plasters are those which are employed for flesh that is rotting or semi-putrified, and he will begin with plasters made from herbs. But instead of a formula designated by some geographic location, Galen starts his account by quoting Criton's "Plaster from Herbs" (*By Kind* 2 [Kühn, XIII, 863–64]), with measurements. One wonders what happened to Galen's gathered drug lore, presumably recorded from his travels, when he proceeds to explain why *Criton's* formula would contain poppies (*mēkōn*: *Papaver* spp.), black henbane (*hyoskyamos*: *Hyoscyamus niger* L.)—these would give the "cold"—and the scarlet pimpernel (*anagallis*: *Anagallis arvensis* L.), which would provide the "drying property." Following in *By Kind* VI, 1 (Kühn, XIII, 869–73) is a "Squill Plaster" (*skilla*: *Urginea maritima* [L.] Baker), again probably from Criton's collection, and Galen commends this formula provided one tempers it with wax (Kühn, XIII, 871). After discussing further recipes from Criton and Andromachus,[103] Galen proceeds to the vexed question of weights and measures: after his valuable discussion of how weights and measures are calculated in Italy, Greece, Alexandria, and Ephesus, it seems clear enough that Galen is rather frustrated by the inexactitude of the formulas he has received in the pharmacological sources, and especially by the inexact equivalences that seem to thwart his reproducing the formulas to his satisfaction.[104] Adromachus continues to supply Galen with the listed plaster recipes, until one reaches "A Tyrian Plaster" (*By Kind* VI, 12; [Kühn, XIII, 915–23]), which turns out to be another medical poem by Damocrates, not an original formula from Phoenician Tyre as might have been recorded by Galen.[105] The confused nature of Galen's drug formulas in *By Kind* may be illustrated by an example from the listings of *malagmata*, "emollient" or "soft" plasters. *By Kind* VII summarizes *malagmata* with an apparent strained classification system, as Galen tries to distinguish them from other plasters,[106] and Galen's quotation from Heras on a compound called the *kērelaion* shows how Galen's written sources had confused the specific names of these drugs—and by implication why the best of the Byzantine writers on pharmacy did *not* use Galen as an exact blueprint:

> *Kērelaion*: Praised by Heras above all among Drugs. "Take freshly defibered clear fat, 44 [Roman] ounces, 24 ounces of beeswax, 6 ounces of cerussite,[107] 6 ounces of massicot,[108] and dissolve together the dry ingredients, and shortly they will become congealed." Heras said "the beeswax and the clear fat are the softening properties." Thus if some beeswax would be mixed with a little oil, you will make what is called by the doctors a *kērelaion*, a wax-oil.[109] But clearly the oil ought not to be called either the squeezings of unripe grape [*to omphakinon*] or oil of unripe olives,[110] nor should one assume the addition of the oil of palm leaves.[111]

The remainder of *By Kind* VII[112] continues in this confusion, with numerous quotations from Damocrates, Andromachus, Asclepiades (probably the "Younger," or Pharmacion), and other names now familiar from other Galenic drug books. One may suspect textual corruptions in the Kühn Greek, but interpolations do not explain away the rampant disorder in drug classifications, except for the broad categories of plasters, emollients, earths, herbal simples, and the like. Even though Galen has a reasonably clear theory of drug action, it is smothered by the numerous and often contradic-

[103] Of interest in terms of preparation technique is "A Plaster from a Whetstone," i.e., a powdered compound rubbed on a whetstone (ed. Kühn, XIII, 874–82; cf. Dioscorides I, 98). Criton also provides Galen with a formula from Heras (*By Kind* VI, 3 [Kühn, XIII, 882–83]), another by Serapion (*By Kind* VI, 4 [Kühn, XIII, 883–84]), and another by Andromachus (*By Kind* VI, 5 [Kühn, XIII, 884–85]). Galen seems to take some data directly from Andromachus (quoting Isidore of Antioch) on a plaster for gangrene (*By Kind* VI, 6 [Kühn, XIII, 885–86]). Then Galen tells us he will take up other sorts of plasters, arguing at some length that one ought not to be ignorant of the good data at one's fingertips—unlike so many in his day (*By Kind* VI, 7 [Kühn, XIII, 889]), and then we receive a formula (again from Andromachus) for the Egyptian *Phaia*[?] Black[?] Plaster (*By Kind* VI, 8 [*Kühn*, XIII, 890–91]), a good example of an excellent compound ignored by physicians (Kühn, XIII, 891).

[104] Ed. Kühn, XIII, 895–97.

[105] *By Kind* VI, 12 (Kühn, XIII, 915–23).

[106] *By Kind* VII, 1 (Kühn, XIII, 946–51).

[107] $PbCO_3$, lead carbonate, or "white lead" (*Psimythion*). Preparation of white lead: Theophrastus *On Stones* 56. Preparation of white lead salves: *Geoponica* XVII, 7.2; XVIII, 15.3; and VII, 15.18 (ed. Beckh, pp. 473, 494 [from Didymus], and 203 [from Sotion]). Cf. Dioscorides V, 82 and 88.

[108] PbO, lead monoxide (*lithargyros*). Cf. *PGM*, XII, 194; Nicander *Alexipharmaca*, 594; Galen, *Drugs by Kind* I, 5: "Plasters Made from Lead Monoxide" (Kühn, XIII, 394–98).

[109] This is Galen's "cooling wax salve" in *Hygiene* VI, 14.8 (ed. K. Koch, *Galeni De sanitate tuenda* [Leipzig, 1923; in *CMG* V 4, 2], p. 195).

[110] Theophrastus, *On Odors* 15. Dioscorides I, 30.

[111] *By Kind* VII, 2 (Kühn, XIII, 952–53).

[112] *By Kind* VII, 4–16 (Kühn, XIII, 958–1058).

tory quotations from earlier sources, and Galen's attempts to "explain" why various drugs might be included in the works of Criton, Andromachus, Damocrates, and others, are often surprisingly feeble. Galen generally has not actually sought out the drugs he prescribes—as he likes to boast—but has availed himself of a rich doxographical tradition in Greco-Roman pharmacy, a tradition that was exploited earlier by Criton in the reign of Trajan,[113] and by Dioscorides in the middle of the first century. Unlike Dioscorides, however, Galen did not simply survey his predecessors' work,[114] but excerpted those tracts in large swatches. Once the early Byzantine pharmacologists had analyzed Galen's "Drug Books," they were forced to rearrange, streamline, and "edit them" rather heavily, even though Galen remained a venerated fountainhead of drug lore. It is very significant that Byzantine medical writers, from Oribasius through Paul of Aegina, quite frequently sought out the "original" writings on drugs from earlier Greco-Roman antiquity, and did not continue the pharmaceutical doxography illustrated by Galen's summaries in the late second century.

Oribasius and Pharmacology

Oribasius functioned as court physician to the Emperor Julian (A.D. 361–363), but he had been friend and confidant of Julian before the eventful months of 360 and 361 that led to his elevation to the undisputed possession of the imperial purple. Oribasius had prepared a synopsis of Galen's works at Julian's request, while the future emperor served Constantius as Caesar in Gaul.[115] In 360—again at the request of Julian—he compiled a second work that summarized not only Galen but also many other medical authorities, and we have forty books plus a number of fragments of the original seventy in this *Medical Collection*. From the *Medical Collection*, one may gauge how Galen's pharmacology was employed by Oribasius, and one may also discern some skillful rearrangements, reclassifications, and fresh juxtapositions as Galen is quoted directly. In many respects, Oribasius' use of Galen's works provides a reasonable measure of what tracts by Galen were known in the mid fourth century, and the numerous quotations from all three of Galen's massive pharmacological books show that they all should probably be included within the "genuine" Galenic corpus. *Antidotes* is also excerpted,[116] but not to the extent that Oribasius uses Galen's *Mixtures and Properties of Simples* (593 citations), *Drugs by Location* (206 citations), and *Drugs by Kind* (62 citations). *Theriac to Piso* does not appear among the quoted extracts.

These raw numbers (almost 600 extracts from Galen's *Simples*, just over 200 from *Location*, and 62 from *By Kind*) may suggest a basic pattern for Oribasius' adaptation of Galenic pharmacology. In the first place, Galen's *Simples* had laid down a fairly precise theory of drug "properties," and this tract also included almost all of the listed medicinals known to Greco-Roman pharmacy; secondly, since Oribasius does not quote Damocrates' medical poems (nor any medical poetry at all), this would suggest that Oribasius valued *Location* and *By Kind* (in which Damocrates' poems bulk large) less than *Simples*, or, that medical poetry had fallen out of fashion by Oribasius' day; third, since Galen had given a fairly complete listing of pharmaceuticals in *Simples*, first listed alphabetically (the plants) and then "classed" by source (animals, minerals), Oribasius apparently assumed Galen's *Simples*, combined with the rearranged alphabetical listing of drugs taken from Dioscorides' *Materia medica*,[117] would provide the important substances used in pharmaceutical therapy; Galen's two other books on drugs (*Drugs by Location* and *By Kind*) did not offer a significant improvement in perceptions of drug lore. Moreover, Galen's *Location* and *By Kind* merely repeated the substances (using other authorities) previously listed in his simples, so that there was no quantitative improvement in Galen's nearly 450 drugs contained in his *Simples* that could not be gained by the more streamlined listing of pharmaceuticals from Dioscorides. Oribasius can thus assume his pharmacology would include all of the over 600 "standard" drugs by a judicious combination of Galen and Dioscorides, as well as careful quotations from other authorities directly from their works. Oribasius' arrangement of drugs most likely resulted from the requirements of an active and personal practice of medicine—particularly seen in the quotations of Galen's *Simples* in *Medical Collection* XV—and his adaptation of drug lore became a standard method in medical botany and

[113] See n. 80 above, and J. Scarborough, "Criton, Physician to Trajan: Historian and Pharmacist," in J. Eadie and J. Ober, eds., *Festschrift Chester Starr* (Washington, D.C., 1984) in press.

[114] Scarborough and Nutton, "Preface," 190.

[115] Oribasius, *Medical Collection* prooemium 1–2 (ed. Raeder, I, 4).

[116] Raeder, IV, 327 (nine citations).

[117] Oribasius, *Medical Collection* XI–XIII (ed. Raeder, II, 80–180).

pharmacology still followed in modern times.[118]

Galen's *Simples* had developed a tight theory of pharmaceutical action, based upon primary "qualities" (viz. properties) of particular classes of drugs, followed by a second set of secondary "qualities," and then a third classification of tertiary properties.[119] Galen had argued that the Hot, Cold, Wet, and Dry were common to all substances, and that changes came to matter through either active or passive influences.[120] This, in turn, explained the effects of all drugs.[121] Following from this premise, Galen can then argue for "secondary" properties and "tertiary" properties from the pharmaceutical effects derived from combinations and mixtures of the "primary" properties, as such would be perceived by the senses.[122] There is, however, a vagueness to Galen's "tertiary" qualities/properties, and Harig has shown that Galen meant merely "local effects" in his "tertiary level," that is, local effects of the "secondary qualities."[123] Thus in the beginning of Book V of *Simples*, Galen can make the statement that it is better to classify pharmaceutical compounds by their *eidē* ("species" or "kinds"),[124] apparently meaning their "useful effects" in pharmacy as they are perceived by the senses. By way of illustration, Galen writes that it is more accurate to say that wheat-meal plaster is a balance between the Wet and Hot,[125] rather than to list the plaster's qualities/properties as pus-producing, soothing, cathartic, and relaxing.[126]

Oribasius does some very significant things with Galen's drug theory, and the following can only be suggestive. In quoting from Galen's *Simples* V, 2,[127] Oribasius merely excerpts what Galen has to say about the "utility of drugs" (*peri chreias tōn pharmakōn*), the basic statement of how one understands drug action. Oribasius has, in effect, extracted exactly those passages from Galen's verbose description of drug properties which are precise and clear: "The utility of drugs among men is often from this alone: the heating, cooling, drying, and the moistening, or from the combination of effects as produced [by these properties]." Oribasius includes Galen's assumptions that such physical properties as condensation of drugs, rarifaction, and so on, would also be explained by the underlying theory of *stoicheia/dynameis*, but the repetitive passages following line 5 (Kühn, XI, 707) are not quoted. *Medical Collection* XIV, 4 (Raeder, II, 184–85), is not a continuation of Galen's *Simples* V, but begins with an excerpt from *Simples* III, 11 (Kühn, XI, 564–65), titled by Oribasius "How One Determines the Elementary Property of the Full Compound by Comparison with an Exactly Balanced Substance." *Simples* III, 11 is employed here because Galen has defined a "moderate *krasis*" (a "balancing," or in archaic English, a "temperament"), and such is determined by the sense of touch. *Medical Collection* XIV, 4.1–3, is extracted from Galen's *Simples* III, 11, but *Medical Collection* XIV, 4.4 is from *Simples* III, 13 (Kühn, XI, 571). Oribasius again has skipped an incredibly verbose and repetitive section of Galen's *Simples*, and extracts exactly those passages which summarize precisely what Galen means in terms of his mid-way *krasis*, after Galen has provided an excellent illustration of the cooling properties of rose oil in *Simples* III, 11. Oribasius has shown his shrewd adaptation and rearrangement of Galen, and the *Medical Collection* becomes an attempt to give Galen a clarity—using his own words—lacking in the original texts. Oribasius also has digested an enormous quantity of Galen's writing, no mean feat in itself, and has simplified Galen's tripartite "intensity theory" of drugs so that the original notion is preserved for the employment of future physicians and pharmacologists. In fact, as Harig has argued, Oribasius' quotations of Galen's *Simples* ensured the preservation of the most essential parts of Galen's theory, shorn of the vague and generally unsatisfactory extension of the theory into a "tertiary" level of effects.[128]

Oribasius exhibits great care in citing his sources. One would expect him to cite materials as he had found them quoted in earlier compendia of recipes, such as are found in Galen's *Drugs Arranged by Location of Ailment* and *Drugs Arranged by Kind*. A few examples of sources cited by name, compared to the sloppy manner of Galen's use of recipe col-

[118] G. Harig, "Die Galenschrift "De simplicium medicamentorum temperamentis ac facultatibus" und die "Collectiones medicae" des Oribasios," *NTM*, 7 (1966), 1–26 [4].

[119] See G. Harig, *Bestimmung der Intensität im medizinischen System Galens* (Berlin, 1974), *passim.*

[120] Galen, *Elements According to Hippocrates* I, 9 (ed. Kühn, I, 485), and *Commentary on Hippocrates' On the Nature of Man* I, 7 (ed. J. Mewaldt, *Galeni In Hippocratis de natura hominis* [Leipzig, 1914; in *CMG* V 9, 1], p. 22).

[121] Galen, *Simples* I, 8 (ed. Kühn, XI, 397).

[122] Galen, *Simples* III, 13, and V, 2 (ed. Kühn, XI, 573 and 709–10).

[123] Harig, *Intensität* (n. 119 above), 110–15.

[124] Galen, *Simples* V, 1 (ed. Kühn, XI, 704–6).

[125] Galen, *Simples* V, 2 (ed. Kühn, XI, 712).

[126] Galen, *Simples* V, 2 (ed. Kühn, XI, 711–12).

[127] Oribasius, *Medical Collection* XIV, 3 (ed. Raeder, II, 184) = ed. Kühn, XI, 706–7.

[128] Harig, "Oribasius" (n. 118 above), *passim.*

lections by Criton, Andromachus, and Asclepiades the Pharmacist, will suggest Oribasius' meticulous care and insistence on quoting *directly* from the original work. It will be recalled that Galen cites Xenocrates for a number of animal-derived drugs,[129] and one would, presumably, expect Oribasius to pick up these citations and record them somewhere in the *Medical Collection*. Except, however, for some scholia recording parallel passages from Xenocrates, Galen, and Dioscorides,[130] and one fragmentary quotation (twenty-one lines) from Xenocrates' "Plasters Made from Whelk [*kēryx*] and murex [shellfish],"[131] Xenocrates appears only in a lengthy, direct quotation from *Foods from Water Animals*,[132] which fits neatly into Oribasius' "elementary" books on preparation and recommendation of healthy foods. Here are how one classifies fish and shellfish,[133] and a catalogue of agreeable and disagreeable fish in the diet. No bloods, rennets, or dungs appear in Oribasius' quotations from Xenocrates, and one is again struck by the display of good judgment in the employment of an earlier source, quoted directly and not through an intermediary. Other quoted authors receive similar treatment (for example, the obscure Heraclas),[134] so that Oribasius has "gone to the sources," unlike his verbose model, Galen.

There is ample evidence throughout Oribasius' writing—*Medical Collection*, [*Medical*] *Synopsis for Eustathius*, and [*Medical*] *Books for Eunapius*—not only that he had read and assimilated the writings of many authorities of medicine in the Greco-Roman tradition, but also that his medical practice included much personal knowledge of pharmaceuticals, which he was pleased to share with his son, and with his friend Eunapius. A few examples will illustrate. *Medical Collection* IX, 27 (= *Synopsis for Eustathius* III, 79 [Raeder, II, 30, and Raeder, ed., *Synopsis*, 89]) is "Plasters from the Husks of Wheat." He tells us that one can use the "leftovers" of the wheat by pounding the husks, and the plaster (made from combining the pounded husks with a honey-vinegar mixture and a gum ammoniac [here probably *Ferula communis* L. or *F. marmarica* Asch. & Taub.; less likely *Dorema ammoniacum* D. Don.]) would be useful as a warming plaster for various skin ailments as well as liver and spleen problems. No source is discernable here, and there is only a slight resemblance to the mention of gum ammoniac by Dioscorides;[135] the suggestions by Dioscorides for *ammōniakon* in *Materia medica* III, 84 (Wellmann, II, 100–102) overlap with those by Oribasius only in terms of being useful for ailments of the liver and spleen (*Materia medica* III, 84.3 [Wellmann, II, 102]), but there is no combination with pounded husks of wheat. It is signifcant that Aetius borrows this account of the plaster of pounded wheat husks directly from Oribasius.[136] Thus, it is apparent that Oribasius was a skilled drug compounder in his own right, also shown by other adapted and "original" medicines.[137] Characteristic of Oribasius' command of drug compounding is his direct simplicity and general avoidance of complicated mixtures that might require exotic ingredients.

Oribasius was also well acquainted with Dioscorides' *Materia medica*, but he—like Galen before him—decided that Dioscorides' precise and difficult system of drug affinities was either too cumbersome for practical use,[138] or too diffuse as it stood. *Medical Collection* XI–XII (Raeder, II, 81–159) is an alphabetized listing of the simples in Dioscorides' *Materia medica* (456 substances, including some of Dioscorides' "animal products," for instance, *stear* ["fat"]), and *Medical Collection* XIII (Raeder, II, 160–80) is "From Dioscorides on the Properties [*Dynameis*] of 'Mined' Drugs [*Metallika*] and their Preparation" (88 medicinals, including various stones and earths). Oribasius has carefully alphabetized 544 pharmaceuticals as contained in Dioscorides' *Materia medica*, and there is, indeed, a succinct clarity that would be absent in Dioscorides' original tract. One can suppose that Oribasius drew up this listing, or one may assume that he took a previously-compiled alphabetical listing and simply reproduced it. Given Oribasius' normal habit of citing almost all of his sources by name, it seems unlikely that he had borrowed the alphabetical register of

[129] Galen, *Simples* X preface (ed. Kühn, XII, 245–53).

[130] Oribasius, *Medical Collection* XI A 54, and XV (ed. Raeder, II, 89, 293, and 296).

[131] Oribasius, *Medical Collection* XV, 3 (ed. Raeder, II, 296–97.).

[132] Oribasius, *Medical Collection* II, 58 (ed. Raeder, II, 47–57).

[133] Oribasius, *Medical Collection* II, 58. 11–13 (ed. Raeder, II, 48).

[134] Oribasius, *Medical Collection* XLVIII, 1–18 (ed. Raeder, III, 262–68). See also C. L. Day, *Quipus and Witches' Knots: The Role of the Knot in Primitive and Ancient Cultures, with a Translation and Analysis of "Oribasius De Laqueis"* (Lawrence, Kansas, 1967), 107–31.

[135] Dioscorides III, 48.3 (ed. Wellmann, II, 62). Cf. Pseudo-Dioscorides, III, 84 (ed. Wellmann, II, 101).

[136] Aetius III, 178 (ed. Olivieri [*CMG* VIII 1], p. 350).

[137] E.g., Oribasius, *Synopsis for Eustathius* III, 77 (Raeder, p. 88) = *Medical Collection* IX, 25 (Raeder, II, 28–29): "A Plaster Made from Beer-Yeast."

[138] Scarborough and Nutton, "Preface," 190.

Dioscorides from an unknown source, and the accuracy of the quotations would indicate that Oribasius had performed this onerous task himself. If so, it may be quite probable that Oribasius' alphabetical text of Dioscorides is the archetype of many later manuscripts of the Greek "alphabetical" Dioscorides, including the justly famous Vienna text of A.D. 512.[139]

From Oribasius to Aetius

Although it can be argued that Theodorus Priscianus' *Euporiston* could be included in the scope of early Byzantine medicine (Priscianus was court physician in the reign of Gratian [A.D. 375–383]), the text was written in Latin, as befitted the court of a western Roman emperor.[140] Moreover, the fascinating farrago of drugs and folklore that make up the *De medicamentis* by Marcellus Empiricus (*fl.* as *magister officiorum* under Theodosius I [A.D. 379–395]),[141] will not be considered here, since the work is in Latin, and belongs more to the history of pharmacy in early medieval western Europe. Caelius Aurelianus (*?fl.* c. A.D. 450) has left us a masterpiece of compression—also in Latin—of the best of the Methodist physicians, and the drug lore of Soranus of Ephesus assumes a major importance.[142] And the compendium of Cassius Felix, called *De medicina*, was published in A.D. 447, with the *a capite ad calcem* therapeutics of Galen summarized in Latin guise.[143] One would like to know more about Hesychius of Damascus (*fl.* A.D. 430 in Byzantium), the father of Psychestrus, Asclepiodotus, and Palladius,[144] but as important as were these medical practitioners in the fifth century, we learn about them through isolated quotations in later authors and from summaries as contained in the *Suda* and Photius' *Library*.[145] Alexander of Tralles (V, 4 [Puschmann, II, 163]) gives us a tantalizing bit about Psychestrus' therapy using a "liquifying diet,"[146] and all of these names, excepting Alexander of Tralles, were associated with some residence or study at Alexandria, which continued to be a famous center for medical education of many varieties.[147] It is only with Aetius of Amida, who had indeed spent time in Alexandria,[148] in the early sixth century that one again can assess the next stages of development in early Byzantine pharmacology.

Aetius of Amida

Drug theory begins Aetius' account of medical practice. In fact, the lengthy *Preface* to Book I of Aetius' *Medical Books* (Olivieri, I, 17–30) is entirely devoted to theoretical pharmacology. The complete *Preface* emerges from Galen, but in a deftly arranged manner from several different Galenic passages, generally from *Mixtures and Properties of Simples*, with the first eighteen lines quoted from *Simples*, prooemium VII (Kühn, XII, 2–4). Even in English translation, one is able to detect Aetius' subtle yet crucial modulations of Galen's original, as well as the important reorganization of vital passages from Galen's pharmacological theory, so that clarity could replace imprecision:

> The variations of the individual effects of drugs are due to each of them being to a certain sufficiency [*tō epi tosonde*: "to a certain degree" is the modern expression] hot or cold or dry or wet, or each having fine [or "small"] or coarse [or "large"] particles [or "parts"]. The extent/measure of the degree, however, of the attachments [lit. "fastenings-together"] in each of the drugs cannot be expressed with truthful accuracy. But we have attempted to encompass and characterize them with adequately clear terms and definitions for use in medical practice [*eis tēn cheian tēs technēs*]. We are demonstrating that there is one kind [*hen genos*] of drugs which is [*aphiknoumenon*: lit. "arriving at" or "coming into"] a same *krasis* as our bodies, when it has received some *archē* of both change and alteration [*alliōsis*] from the hot in this kind of drugs, and, that there is another kind of drugs which is hotter. From this, it seems to me that four orders [*taxeis*] can be made: the first is indistinct [*asaphē*] to the senses, [and] detecting it necessarily comes through pure reason [*logos*]; the second is distinct and perceivable to the senses; the third is rather hot, but not to the point of burning; the fourth and last is the corrosive or caustic kind of drugs.[149] Likewise also for the cooling kind of drugs, the first order must come from pure reason in demonstrating its coldness, the second is cooling detectable by the senses, the third is rather cold, and the fourth causes

[139] Vienna, Österreichische Nationalbibliothek MS Gr. 1.
[140] V. Rose, ed., *Theodori Prisciani Euporiston* (Leipzig, 1894).
[141] Marcellus (ed. Liechtenhan).
[142] Caelius Aurelianus (ed. and trans. Drabkin).
[143] V. Rose, ed., *Cassii Felicis De medicina* (Leipzig, 1879).
[144] Hunger, "Medizin," 292. Temkin, "Byzantine Medicine," *DOP*, 16 (1962), 100 = *Double Face of Janus*, 205–6.
[145] On Jacob Psychestrus: R. Asmus, *Das Leben des Philosophen Isodorus von Damaskios aus Damaskos* (Leipzig, 1911), esp. 72–75.
[146] Cf. Alexander of Tralles, ed. Puschmann, I, 74, and reffs. Puschmann, II, 162 n. 1.
[147] Hunger, "Medizin," 292. Temkin, "Byzantine Medicine," 101–2 = *Double Face of Janus*, 206–7.
[148] Aetius I, 131, and II, 3 (ed. Olivieri [*CMG* VIII 1], pp. 65 and 154).
[149] *Pharmaka kaustika*. Galen, *Simples* V, 15 (ed. Kühn, XI, 754). Zopyrus in Oribasius, *Medical Collection* XIV, 57.1 (ed. Raeder, II, 226).

necrosis.[150] Analogous in these definitions are also the wetting and drying drugs.[151]

Galen (*Simples* VII, 10.1) then proceeds to speak of catnip (*kalaminthos*: *Nepeta cataria* L.),[152] writing "catnip is basically of small particles and has a hot and dry *krasis*, and is from the third order with both qualities."[153] Aetius, however, does not continue with *Simples* VII: the next twelve lines in the *Preface* to Book I of the *Medical Books* come from Galen, *Simples* III, 13 (Kühn, XI, 571–72):

> Thus let there be set down a clear instruction of these very degrees [or sufficiencies]: in the first order [*taxis*] of cooling drugs would be placed rose oil or the rose (*Rosa gallica* L., and related spp.) itself; in the second would be placed rose-juice [*ho to rhodou chylos*]; and in the third and fourth orders we would include—for good reason—the very cold drugs: hemlock (*kōneion*: *Conium maculatum* L.), the juice of the opium poppy (*mēkōneion*, viz. opium from *Papaver somniferum* L.), mandrake (*mandragoras*: either *Mandragora officinarum* L. [mandrake], or *Atropa belladonna* L. [deadly nightshade]), and black henbane (*hyoskyamos*: *Hyoscyamus niger* L.). Concerning the hot drugs, dill (*anēthon*: *Anethum graveolens* L.) and fenugreek (*tēlis*: *Trigonella foenum-graecum* L.) are in the first order; the drugs which appear next to them are in the second order; and in the third and fourth orders we would include the caustic and corrosive drugs. And in the same manner in regard to the wetting and drying drugs, one begins with a drug of moderate and proportionate [*krasis*], [and] we will make orders [*taxeis*] one after the other until the farthest extremes [*akroi*]. For some use of such knowledge is not unimportant in the medical practice [*methodos*].

Aetius now drops Galen's *Simples* III, 13 (which goes on to grumble about the general ignorance of doctors in such matters), and switches to an adaptation of *three lines* from Galen's *Simples* IV, 4 (Kühn, XI, 632), in which Aetius writes: "One should also use the sense of taste, and retain in the memory the peculiarity of each quality of the juices" (Olivieri, I, p. 18, lines 15–17); and then Aetius shifts again to four, slightly modified lines from Galen, *Simples* I, 39 (Kühn, XI, 453), ". . . as, for example, when such a substance [*sōma*: lit. "body"] is laid on the tongue, it greatly dessicates, contracts, and deeply roughens it, such as unripe wild pears (*achrades aōroi*: probably *Pyrus pyraster* Burgsd., or *P. amygdaliformis* Vill.), Cornelian cherries (*krana*: *Cornus mas* L.), and the like; every such substance is called sour [or "astringent": *stryphnon*] since it is intensely bitter [*austēron*]" (Olivieri, I, p. 18, lines 17–20). With some slight syntactical adaptations, Aetius has provided a lucid account of Galen's basic pharmacological theory, using Galen's own words and phrases, but judiciously selected and rearranged so that the reader understands (as best as he would be able) this system of drug classification "by intensity" or "by degree." What has been muddled, scattered, and often repeated in Galen's original texts, has now been compacted, edited, and streamlined. The remainder of Aetius' *Preface* to Book I of his *Medical Books* shows a similar ability, and Galen's enormously influential classification of drugs "by degrees" has emerged in the form in which it would be used by countless physicians and pharmacists until well into the eighteenth and nineteenth centuries.

Once Aetius has completed his redaction of Galen's drug theory, he then proceeds to list alphabetically 418 medicinals of plant origin, almost all quoted from Galen, but with an occasional passage from Rufus, Dioscorides, and Oribasius.[154] Book II lists, in part alphabetically, 195 medicinals,[155] an occasional clipped, simplified recipe of drugs derived from metals (lit. "things mined"), stones, earths, and a wide spectrum of "animal products" (from milk to insects); most entries are quoted from Galen, Oribasius, and Dioscorides, but there are a few citations from Rufus, Antyllus, and Theophrastus. Book II, 196–271 returns to the "drugs by degrees" system[156] and now "fits" the 613 substances into the various grades of heating, cooling, drying, and moistening medicinals, followed by a discussion of the properties (*dynameis*) of foods.[157] Then Aetius turns his attention again to the definition of Galen's puzzling "large" and "small" particles as they relate to the properties of foods,[158] but the source is Oribasius, not Galen. With Book III,[159] Aetius begins to list formulas and recipes for cathartics and similar drugs, and his arrangement of simples in the first two books is explained: one has to be acquainted with the basic components—and the theory of how such ingredients would "work"—before the pharmacologist-physician could

[150] Galen, *Bloodletting* 4 (ed. Kühn, XI, 265).
[151] Aetius I *prooemium* (first eighteen lines) (ed. Olivieri [*CMG* VIII 1], pp. 17–18).
[152] A rare form. Cf. Nicander, *Theriaca* 60.
[153] Ed. Kühn, XII, 4.
[154] Aetius I, 1–418 (ed. Olivieri [*CMG* VIII 1], pp. 30–146.
[155] Aetius II (ed. Olivieri [*CMG* VIII 1], pp. 147–255).
[156] Ed. Olivieri (*CMG* VIII 1), pp. 223–55.
[157] Aetius II, 239 (ed. Olivieri [*CMG* VIII 1], pp. 237–38).
[158] Aetius II, 240–241 (ed. Olivieri [*CMG*, VIII 1]), 237–40.
[159] Ed. Olivieri (*CMG* VIII 1) pp. 256–355.

proceed into prescription of pharmaceuticals by a combined class of action. In Book IV,[160] Aetius takes up formal dietetics, quoting heavily from Galen's *Hygiene*,[161] and one also reads the expected admonitions about exercise and a generally healthy regimen to maintain a healthy body. His earlier discussion of the properties of foods now "fits," as he can suggest which foods would do the best service in the diet, according to the theoretical constructs laid down in Book II, 239–241.[162]

Books V and VI take up diagnostics and the venerated theory of the humors,[163] and some common diseases that can be elucidated through these theories. Only occasional pharmaceuticals appear as they are appropriate to the discussions, but Aetius' major sources have shifted to lengthy quotations from Aretaeus of Cappadocia as well as Galen and Oribasius. Book VII is one of the finest accounts of ophthalmology written in ancient and medieval times,[164] and the discussion is replete with collyria recipes drawn mostly from Galen and Oribasius. Although Aetius does not mention cataract couching, there are clear descriptions of sixty-one eye diseases, showing close acquaintance with the essential anatomical structures.[165] Book VIII is a mixture of materials on inflammations, various plasters, and the like, with many details drawn from Galen's *Compound Drugs Arranged by Place of Ailment.* And although Aetius' complete *Medical Books* are in sixteen books (hence the traditional title of *Tetrabiblon* of the *Biblia iatrika hekkaideka* from the customary division in manuscripts into four *tetrabibloi* to every four *logoi*), one lacks competent modern, well-edited Greek texts,[166] and therefore the pharmacy that teems in the last eight books cannot be accurately assessed. Famous, of course, is Book XVI with its splendid summary of gynecology and obstetrics, but the most often cited Ricci translation is based on the Cornarius *Latin* translation of 1542,[167] and the most recently edited Greek text suffers from a number of inadequacies.[168]

Alexander of Tralles

As Aetius of Amida had carefully redacted earlier pharmacology, so also Alexander of Tralles reworked much of the earlier data into a lengthy compendium of suggested treatment of diseases by their symptomatology, explained through a general pathlogy that assumed a causation of illness from morbid humors. Alexander was born in A.D. 525, and was the son of a physician named Stephen. Our main data for Alexander's family comes from Agathias' *Histories* V, 6.3–6,[169] and Stephen had fathered five sons, all of whom became prominent in their professions: Anthemius, the architect-engineer who designed the magnificent St. Sophia; Olympius, a gifted lawyer; Metrodorus, a pre-eminent grammarian; Dioscurus, a doctor, ". . . who lived out his life in his native city in which he carried on the practice of medicine with great success;"[170] and Alexander, who "lived in Rome, summoned to hold high position."[171] Agathias implies that Alexander's fame had not reached the ears of Justinian, whereas both Anthemius and Metrodorus were well known to the emperor. After much travel and experience, Alexander settled in Rome and died in A.D. 605.

Of all the Byzantine physicians, Alexander of Tralles has exercised the greatest attraction for modern medical historians, due to his direct experience with the practice of medicine, vividly and frequently recorded in his extant books on various aspects of medical treatment. Two relatively modern translations (in French and German) of Alexander's works have been produced, and both Puschmann and Brunet are impressed by what they perceive as the "strikingly modern" approach by Alexander to medicine and pharmacy.[172] Alexander does represent a sharp contrast to the arid scholasticism of Aetius, but both Oribasius and Paul of Aegina were clearly practicing physicians, and

[160] Ed. Olivieri (*CMG* VIII 1) pp. 356–408.

[161] E.g., Aetius IV, 1 (ed. Olivieri [*CMG* VIII 1], pp. 358–59), and Galen, *Hygiene* I, 1 (ed. Koch [n. 109 above], p. 3); and Aetius, IV, 36 (ed. Olivieri, pp. 378–79) and Galen, *Hygiene* III, 3 (ed. Koch, pp. 85–86).

[162] Ed. Olivieri (*CMG* VIII 1), pp. 237–40.

[163] Ed. Olivieri (*CMG* VIII 2), pp. 1–249.

[164] Ed. Olivieri (*CMG* VIII 2), pp. 250–399.

[165] See Emilie Savage-Smith, "Byzantine Ophthalmology" (above in this volume), esp. nn. 61–69.

[166] Barely serviceable "modern" texts of various books of Aetius' *Tetrabibloi* include: G. A. Kostomiris, ed., *Aetiou Logos dōdekatos* (Bk. XII) (Paris, 1892); S. Zervos, ed., *Aetio Amidēnou Logos dekatos kai tritos ē Aetiou Amidēnou Peri daknontōn zōōn kai iobolōn* (Bk. XIII) in *Athēna*, 18 (1905), 241–302; and S. Zervos, ed., *Aetiou Amidinou* [sic] *Logos dekatos pemptos* (Bk. XV) in *Athēna*, 21 (1909), 3–144. Bk. XI is in the Daremberg and Ruelle edition of Rufus, pp. 85–126.

[167] J. V. Ricci, trans., *Aetios of Amida: The Gynaecology and Obstetrics of the VIth Century A.D.* (Philadelphia, 1950).

[168] S. Zervos, ed., *Aetii Sermo sextidecimus et ultimus* (Leipzig, 1901).

[169] R. Keydell, ed., *Agathiae Myrinaei Historiarum* (Berlin, 1967; *CFHB*, II), p. 171.

[170] *Ibid.*

[171] *Ibid.*

[172] Alexander (trans. Brunet), Vol. I. Puschmann, ed., Alexander, I, 75–87, 287–88.

their writings show a sense of the clinic as do those by Alexander. It will not, however, be accurate to describe Alexander of Tralles as a "modern" any more than to designate Galen as such; but Alexander is, indeed, humane and conscientious in his practice, meticulous in his prescriptions, and careful with his command of earlier authorities in medicine. Drugs are scattered throughout Alexander's books, given as recipes for the treatment of specific diseases, usually through the long-lived "treatment by contraries." The occasional complexity of Alexander's drug prescriptions (using 495 different pharmaceuticals) are justified by conflicting symptoms, and many medicinals are recorded as efficacious as verified by personal observation and experience. A critical attitude toward his numerous written sources is characteristic throughout Alexander's works, illustrated by the following, which appears in Book V, 4, "On Viscous Humors and Thick Masses Found in the Lung:"

> This is a true statement by Galen on Archigenes:[173] "He was but a man and it would be difficult for him not to make mistakes in many things, being completely ignorant, making bad judgments, and who provided carelessly written accounts." And I would not have said this about such a learned man, unless Truth itself had not inspired me and urged me on, and did I not believe that keeping silent was sinful. For a doctor who does not speak his opinion commits a great sin and through his silence is greatly to be condemned. But one ought to follow that which Aristotle says he has stated: "Plato is my friend, but the Truth is also my friend; between the two, one must choose the Truth."[174]

Alexander does not devote any of his tracts specifically to drugs, but pharmaceutical therapy is very prominent throughout the various subdivisions, for example, fevers, headaches, what we would call "nervous diseases," melancholia, ophthalmology, the rightly famous "Letter on Intestinal Worms," lung diseases, cholera, gout,[175] and so on. Many of the drug recipes seem original, although the particular ingredients have all been used and defined in Greek, Roman, and earlier Byzantine pharmacy. There are occasionally "new names" applied to certain substances, and this can be illustrated by Alexander's "Armenian Stone," which is part of a recipe in *On Fevers* VII [Quartans] (Puschmann, I, 429). Earlier Greek sources—including the *Papyri Graecae Magicae* XII, 201—had noted the use of *ios chalkou* ("verdigris," or copper oxyacetate, approximately $[C_2H_3O_2]_2Cu{\cdot}Cu[OH]_2{\cdot}5H_2O$), but Alexander's *Armeniakos lithos* has taken the place of *ios chalkou*. This "new" substance had been foreshadowed in Dioscorides, *Materia medica* V, 90, and if we understand the geological chemistry the "Armenian Stone" is a combination of copper oxyacetate, azurite ($2CuCO_3{\cdot}Cu[OH]_2$), and malachite ($CuCO_3{\cdot}Cu[OH]_2$).[176] Roman and Byzantine pharmacy could substitute one "kind" of copper oxyacetate for another, and it is probable that Alexander knew the "Armenian Stone" in the same role as had been played by verdigris in earlier prescriptions. The remainder of the recipe "On the Armenian Stone" suggests that Alexander's "new" pharmacy consisted of rearrangement of ingredients according to his experience:

> The stone, which is called "The Armenian," given washed or unwashed in a dosage of 4 *keratia* [c. 800 mg./12 grains] works well for all forms of quartan fever, since it [performs] as no other for the evacuation of black bile. Washed in water, it completely purges the lower bowels, but unwashed it is an emetic which does not cause too much heating, unlike the others. But if some [of your patients] regard the solution of "the stone" with disgust, make little pills using the following ingredients:
> 4 *grammata* [c. 4.6 grams/4 scruples/80 grains] of *pikras* [an aloe-honey mixture][177]
> 3 *grammata* [c. 3.5 grams/3 scruples/60 grains] of *epithymon* [lesser dodder, *Cuscuta epithymum* (L.) Murr.][178]
> 1 *gramma* [c. 1.2 grams/1 scruple/20 grains] of *agarikon* [prob. a tree mushroom of *Boletus* spp.][179]
> 1 *gramma* of *Armeniakos lithos*
> 5 "berries" of *karyophylla* [cloves, *Eugenia caryophyllata* Thunb.; here the sun-dried, unopened flower-buds][180]
> 5 *grammata* [c. 5.9 grams/5 scruples] of *skammōnia* [scammony, *Convolvulus scammonia* L.][181]

[173] More-or-less Galen, *Drugs by Location* II, 1 (ed. Kühn, XII, 535).

[174] Alexander (ed. Puschmann), II, p. 155; French trans. by Brunet, III, 124–25.

[175] Alexander (ed. Puschmann), I, 290–439 (fevers; in 7 books); I, 465–507 (headaches); phrenitis, lethargy, epilepsy, etc. (I, 508–91); melancholia (I, 591–612); ophthalmology (II, 2–70); intestinal worms (II, 586–600); lung diseases (II, 146–244); cholera (II, 320–34); gout (II, 500–86).

[176] Cf. D. Goltz, *Studien zur Geschichte der Mineralnamen in Pharmazie, Chemie und Medizin von den Anfängen bis Paracelsus* (Wiesbaden, 1972; *SA* Beiheft 14), 146–47.

[177] Juvenal VI, 180, and Galen, *Hygiene* VI, 10.19 (ed. Koch [n. 109 above], p. 188).

[178] Dioscorides IV, 177 (ed. Wellmann, II, pp. 326–27). Galen, *Hygiene* VI, 7.18 (ed. Koch [n. 109 above], p. 182).

[179] Maggiulli, *Nomenclatura* (n. 55 above), 85–88.

[180] Paul of Aegina VII, 3 (ed. Heiberg, II, 211). A. F. Hill, *Economic Botany*, 2nd ed. (New York, 1952), 445–46. J. W. Purseglove, E. G. Brown, C. L. Green, and S. R. J. Robbins, *Spices* (London, 1981; 2 vols.), I, 237 ("fruits").

[181] Theophrastus, *HP* IV, 5.1, and IX, 1.3. Nicander, *Alexipharmaca* 565. Dioscorides IV, 170 (ed. Wellmann, II, 318–19).

> Mix with juice of *kitrion* (citron, *Citrus medica* L.),[182] or with *krokomēlon* (a jam made from quince [*Cydonia oblonga* Mill.] and saffron [*Crocus sativus* L.]), or with *rhodomēlon* (a jam made from roses [*Rosa gallica* L.] and quince),[183] or with *rhodomeli* (rose-honey mixture). The dose is 2 *grammata* [c. 2.4 grams/2 scruples/40 grains].[184]

It is significant that an alchemical papyrus from late Roman or Byzantine Egypt also has the combination of water and verdigris,[185] so that Alexander has recorded a common association of "washing" the "green rust" that is copper oxyacetate. The remaining substances in the recipe are known from earlier Greco-Roman sources, and even though the cloves appear exotic, they were known in Roman pharmacy in the first century,[186] but with the close links in the traditions between Cosmas Indicopleustes and Alexander,[187] it seems that this peculiar *hapax legomenon* may reflect a special connection with the spice trade from the Far East. The text of Alexander, *On Fevers* VII [Quartans] (Puschmann, I, 429 and 431) shows a careful assessment of drugs in the context of the ancient humoral pathology, and it appears that this recipe—and many others by Alexander—was compounded after a lengthy experience with patients who exhibited quartan fever. Alexander's pharmacy indicates that Byzantine drug lore was anything but repetitive and static: it shows a continual attempt by the best of the early Byzantine physicians to utilize the traditional pharmacopoeia in new patterns, while retaining the theoretical context of Hippocratic and Galenic medical theory.

Theophilus Protospatharius and Paul of Aegina

Before considering the lucid summary of pharmacology by Paul of Aegina (*fl.* in the 640s in Alexandria),[188] the works of Theophilus Protospatharius should be mentioned. Although there has been debate concerning the century in which Theophilus practiced medicine,[189] the dating by Krumbacher seems to have stood up to scrutiny; we may thus continue to assume that Theophilus lived during the reign of Heraclius (A.D. 610–641). Whenever one dates Theophilus, there can be little doubt about his masterful conglomeration of the ancient medical classics with the Byzantine Christian outlook, nicely exemplified by his *On the Structure of the Human Body*,[190] which fuses Galen's demiurge and teleology in *Use of Parts* with a continually emphasized *ho demiourgos theos hēmōn*.[191] Of interest for Byzantine pharmacy is the short fragment of Theophilus' *On Excrements*,[192] indicating a continued use of dungs in medicinals. And of fundamental interest in the fresh approaches of Byzantine medical practice and diagnosis is Theophilus' *On Urines*,[193] which became the probable ancestor of so many Byzantine works on the topic.

The seventh of Paul's *Seven Books* is devoted solely to drugs and pharmaceuticals and represents a culmination of the Greek, Roman, and early Byzantine search for clarity in drug lore. In the first six books, Paul does indeed give a great number of prescriptions as treatments for diseases, but in the seventh, he gathers all of the 600 plants and 80 non-botanical ingredients into a crisply clear alphabetical catalogue. First, he pens a precisely worded introduction to drug theory, adapted from Oribasius and Aetius:

> On the Mixtures [*kraseis*] of Substances as Indicated by Their Tastes. It is not adequate to judge from the smell concerning the *krasis* of things perceived by the senses. Substances without odors are made up of large particles, but it is not clear whether they are hot or cold. And things which do have an odor, to a certain extent, are made up of small particles and are hot. But the degree of the smallness of their parts, or of their heat, is not apparent, because of the inequality of their substance. And still more uncertain it is to judge them according to their colors, since with every color are found hot, cold, drying, and wetting substances. In tasting, however, all parts of the substances undergoing tasting come into contact with the tongue and stimulate the sense of taste, and thus one can judge clearly their properties in their *kraseis*. Astringents, therefore, contract, obstruct, condense, dispel, and thicken; and added to all of these properties, they are cold and drying. That which is acidic cuts, divides, thins, removes obstructions, and cleans without making heat; but that which is acrid is like the acidic in being thinning and purging, but it differs from it: the acidic is cold, and the acrid is hot; moreover, the acidic repels, but the acrid attracts, consumes, dissolves, and promotes scab [or scar] formation. Similarly, that which is

[182] Dioscorides I, 115.5 (ed. Wellmann, I, 109). Galen, *Simples* VII, 12.19 (ed. Kühn, XII, 77).

[183] Cf. Alexander (ed. Puschmann), I, 479, 503, 523, 613, and II, 371, 495, 567 [further reffs. to the rose-quince jam]; and cf. Alexander, I, 327, 383, 415, 613, and II, 61, 275, 371, 591, 593 [further reffs. to rose-honey].

[184] Alexander (ed. Puschmann), I, 429 and 431 (Greek text).

[185] *PGM*, XII, 193–201.

[186] Pliny, *Natural History* XII, 30.

[187] The "Cosmas," to whom the *Fevers* is dedicated (Puschmann, I, 289) is probably Cosmas Indicopleustes, whose father was an early medical teacher of Alexander (Puschmann, I, 83, following Meyer, *Botanik*, II, 384).

[188] Hunger, "Medizin," 302.

[189] *Ibid.*, 299.

[190] Ed. Greenhill.

[191] Hunger, "Medizin," 299.

[192] Ideler, I, 397–408.

[193] Ideler, I, 261–83.

bitter cleans the pores, is cleansing and thinning, and cuts the thick humors without any heat perceived by the senses. What is wet is cold, thick, and promotes condensation, contraction, blockage, necrosis, and torpidity. By contrast a salty substance contracts, strengthens, preserves as in pickling, and dries without detectable heat or coldness. What is sweet relaxes, "cooks" [viz. promotes "coction"], softens, and lessens density; and what is oily moistens, softens, and relaxes.[194]

On the Orders and Degrees of the *Kraseis* [adapted from Oribasius and Aetius]. A moderate drug is of the same *krasis* as that to which it is applied, so that it does not dry, moisten, cool, or heat, and it should not be called dry, wet, cold, or hot. But that which is drier, moister, hotter, or colder, is thereby known from its dominant property [*dynamis*]. It will be satisfactory to make—for practical use—four orders [*taxeis*] according to the dominant property, naming the substance hot as appropriate to the first order, when it would heat indistinctly and it would require reason to demonstrate its property; likewise this would be true for the cold, dry, and wet, when the dominant property requires reason to demonstrate its existence, and it has no strong or apparent property as perceived by the senses. And such substances as are clearly those having drying, wetting, heating, and cooling properties may be said to be in the second order. Such substances which have these properties, but not to an extreme degree even though they are strong, may be said to be in the third order, but such substances as those which are hot enough to cause scarring or burning are in the fourth order. Similarly, such substances as those which are so cold as to cause necrosis are also in the fourth order. Nothing, however, is found drying in the fourth order that does not burn: for that which dries to an extreme degree [*akrōs*] also always burns, for example, chalcopyrite [prob. $CuFeS_2$],[195] rock alum [a ferrous sulfate],[196] and quicklime [CaO].[197] But a substance may be in the third order of dessicants without being caustic, such as those substances which are sharply astringent, *e.g.* the juice of unripe grapes, sumac [*Rhus coriaria* L.],[198] and alum [prob. a potash alum: $KAl(SO_4)_2 \cdot 12H_2O$].[199]

Comparing this concise summary with the attempts by Galen to bring some sort of order and clarity into the chaos of drug lore delineates the Byzantine ability in choosing essentials and explicating them with great precision. Galen had posed questions and—having rejected the brilliant "drugs-by-affinity" system of Dioscorides—attempted an ordering for pharmaceuticals; but Galen had failed to provide a satisfactory method, even though he perceived three separate approaches evinced in his *Simples*, *Drugs by Location*, and *Drugs by Kind*. Oribasius had excerpted much of Galen, and had shown a method of extraction of drug theory.[200] Aetius of Amida had further refined the attempts by Galen to comprehend medicinals by a "system of degrees," but even though there is a judicious care in the lengthy preface on drugs and drug lore in Aetius, *Medical Books* I, there remains a muddled character and a somewhat jagged result from the painstaking juxtaposition of the carefully chosen extracts of Galen's drug theory. Alexander knows his Galen, but chooses to concentrate on the practical aspects of drug lore, so that one does not find a specific "book" on pharmaceuticals either in Alexander's separate tracts on fevers, or in his extant Twelve Books on Medicine: the theory of drugs is embedded in the recipes recorded. Paul's distillation of classical drug theory has finally captured the essence, and it has the characteristics of filtration and the reworked theory seen earlier in Oribasius and Aetius. Paul is also deeply learned in the medical classics, but his compilation bears the marks of an age skilled in ensuring that adaptation accompanied a creative synthesis borne of direct clinical experience combined with venerated assumptions applied to the "modern" age of Heraclius and the Arab invasions of Egypt, Palestine, Syria, and beyond. In the broader historical and cultural context, the early Byzantine physicians should be viewed as part of the same tendencies which produced the brilliant compactions of Roman law from the *Codex* of Theodosius through the *Institutes*, *Digest*, and *Novella* of Justinian.

Appendix: The Papyri and Byzantine Medicine on Multi-Ingredient Incense. *Kyphi* and *Krisma*

Among several hundred medicinals mentioned in the collection of Greek and Coptic papyri known as the *Papyri Graecae Magicae*,[201] occur the names

[194] Paul of Aegina VII, 1 (ed. Heiberg, II, p. 185).

[195] Dioscorides V, 74 and 100. *PGM*, XII, 195 and 399. Goltz (n. 176 above), 156–57 (μίσυ).

[196] Χαλκῖτις most often $Fe_4(OH)_2(SO_4)_5 \cdot 18H_2O$, as in the χαλκῖτις στυπτηρίη of the Hippocratic *Wounds* 14 (ed. Littré, VI, p. 416); ἄνθος αἰγυπτίη χαλχοῦ ὀπτὸν, στυπτηρίη αἰγυπτίη ὄπτη. Dioscorides V, 99. Goltz (n. 174 above), 154–55.

[197] Here τίτανος, as contrasted to the usual ἄσβεστος. Goltz (n. 176 above), 171.

[198] Theophrastus, *HP* III, 18.3. Dioscorides I, 108 (ed. Wellmann, I, pp. 101–2).

[199] Here the common στυπτηρία, as in Aristotle, *Historia Animalium* 547a20.

[200] E.g., Oribasius, *Medical Collection* XIV, 5 and 11 (ed. Raeder, II, 185–86 and 193), extracted from Galen, *Simples* I, 38, and V, 26–27 (ed. Kühn, XI, 450–51, and 785–87). Behind Oribasius, *Medical Collection* XIV, 5.1–2 (ed. Raeder, II, 185)—as quoted by Galen—are Plato, *Timaeus* 65B-66C, and Theophrastus, *De causis plantarum* VI, 4.1.

[201] My "count" is 425 different herbs, minerals, insects, dungs, etc. An English translation of the entire *PGM*, with commentar-

of two kinds of multi-ingredient incense, *kyphi* and *krisma*.[202] The anonymous writers apparently presume that their readers would know the ingredients for these two incenses, much as they have assumed a knowledge of the numerous medicinal plants, insects, minerals, and other animals employed in a curious mixture of rational and irrational medical-cum-magical prescriptions.[203] These papyri generally emerge from late Roman and Byzantine Egypt, and one may be sceptical of claims that Greek medicine had made its way into the everyday traditions of the native Egyptians, but it also must be recalled that a common knowledge of plants and animals among ancient peoples would be "taken for granted,"[204] a factor often ignored by modern scholars, who presume a constant specialized expertise, analogous to modern medicine and pharmacy. The magical papyri, however, afford a rare glimpse into the actual "medicine of the masses" (at least in Roman and Byzantine Egypt), and this medicine has great affinity to the religious/magical medicine explicated by Gary Vikan in this collection of essays.[205] If, however, the "upper class" pharmaceutical sources had not recorded the exact names of plants and herbs,[206] one would be reduced to learned speculation concerning ingredients, particularly in the cases of drugs compounded from a number of substances. *Kyphi* and *krisma* show a sophistication of both compounding drugs among the so-called common folk, and they also indicate a developing history of their own, destroying the accepted mythology of modern medical historians that ancient medicine developed to a certain point, and then remained utterly static for countless centuries. By contrast to this assumption, the Greek texts show that Egyptian priest-physicians—and their non-Egyptian Greek, Roman, and Byzantine medical counterparts—were in a continual process of "improving the product." One is able to trace *kyphi* from the first century through the mid seventh century, and the mentionings in the magical papyri indicate that such compounds were available far beyond the urban centers of the Roman and Byzantine Empires.

ies, will shortly appear (ed. H. D. Betz, and a team of a dozen scholars), to be published by the University of Chicago Press.

[202] *PGM*, IV, 1313–14, 2971; V, 221; VII, 538, 873.

[203] Paralleled in the Greek texts known as the *Cyranides*. Dimitris Kaimakis, ed., *Die Kyraniden* (Meisenheim am Glan, 1976).

[204] G. E. R. Lloyd, *Science, Folklore and Ideology* (Cambridge, 1983), 119–35.

[205] See G. Vikan, "Art, Medicine and Magic in Early Byzantium" above in this collection of essays.

[206] Esp. Theophrastus in *HP* and *De causis plantarum*, and Dioscorides in his *Materia medica*.

Dioscorides is well acquainted with Egypt, and his *Materia medica* has the first Greek record of *kyphi*, a multi-ingredient incense that not only was to be burned for its heavy and pungently aromatic odor, but which also was an effective medicinal salve—one could even eat it for presumed benefits. Dioscorides writes that in the Egypt of his day (the mid first century) there were many formulas for *kyphi*, and that he is setting down only one of them (*Materia medica* I, 25 [Wellmann, I, pp. 28–29]), and he lists ten ingredients with measures: ½ *xestēs* [c. ½ pint] of nut grass [*kyperos*: *Cyperus rotundus* L.]; ½ *xestēs* of ripe juniper berries [*Juniperus communis* L.]; 12 *minae* [c. 11 lbs.] of raisins, "the seeds having been removed"; 5 *minae* [c. 4.5 lbs.] of purified pine resin [*rhētinē apokekatharmenēs*]; 1 *mina* [c. 15 oz.] of sweet flag [*kalamos arōmatikos*: *Acorus calamus* L.]; 1 *mina* of camel's thorn (oil) [*aspalathos*: *Alhagi camelorum* Fisch.]; 1 *mina* of camel grass (oil) [*schoinos*: *Cymbopogon schoenanthus* Spreng.]; 12 *drachmai* [c. ¾ lb.] of myrrh [*smyrna*: *Commiphora* spp.]; 9 *xestai* [c. 9 pints] of old wine; and honey as part of the preparation instructions, viz.:

> Having removed the seeds from the raisins, pound and triturate them with the wine and the myrrh, and having pounded and sifted the rest of the ingredients, combine them all to soak for one day; then, having boiled the honey until it has a glutinous consistency, mix it carefully with the melted pine resin, and then having carefully pounded together the rest of the ingredients, put up for storage [this incense] in an earthenware vessel.[207]

Dioscorides does not say if other *kyphi* recipes in his time were more complicated, or if they had more ingredients, but Plutarch, *Isis and Osiris* 383E(80)–384C lists a *kyphi* formula with sixteen ingredients. Ten are the same as in Dioscorides' recipe (honey, wine, raisins, nut grass, pine resin, myrrh, camel's thorn oil, two sizes [large and small] of juniper berries, and sweet flag), but Plutarch's list adds six more ingredients: hartwort (*seselis*: *Tordylium officinale* L.), mastic (*schinos*: *Pistacia lentiscus* L.), Dead Sea bitumen (*asphaltos*: $C_nH_{2n}O_n$ + V, Ni, Mo [traces]), rush (*thryon*: *Juncus glaucus* Sibth.), spinach dock (*lapathon*: *Rumex patientia* L.), and cardamon (*kardamōmon*: *Elettaria cardamomum* [L.] Maton.). Unlike a similar recipe, reduced to a medical poem by Damocrates,[208] Plutarch provides no measures, nor does he give any instructions for the preparation of the *kyphi*. He simply writes that "the ingredients

[207] Dioscorides I, 25 (ed. Wellmann, I, pp. 28–29).

[208] Damocrates in Galen, *Antidotes* II, 2 (ed. Kühn, XIV, 117–19).

are not compounded haphazardly, but whenever the drug-preparers [*myrepsoi*] are mixing these substances, sacred writings are read to them."[209] Since the *Suda* mentions a work by Manetho called *Preparation of Kyphi-Recipes*,[210] Plutarch probably gained his listing of the sixteen ingredients from this lost book,[211] which suggests that Dioscorides' first-century *kyphi* recipe represented a pared-down version of earlier Ptolemaic Egyptian listings for *kyphi*, in turn derived from very ancient Egyptian origins.[212] "They use *kyphi* in both drinks and ointments,"[213] so Plutarch says, and even though he gives some farfetched speculation on why this incense should have been so valued as a drug, Plutarch has recorded an important detail: *kyphi* was commonly consumed in a drink.

Paul of Aegina III, 28.2 (ed. Heiberg, I, p. 206) mentions a *kyphi*, called "the lunar" (*kyphi selēniakon*), which is termed *chrisma selaniakon* in the papyri.[214] Paul writes that, in addition to being used to give a pleasant (if heavy) odor, it is to be rubbed into the forehead as a salve. Oribasius had recorded a formula for a "lunar kyphi" with twenty-five ingredients,[215] while Paul's detailed recipe for the "lunar incense-salve" has twenty-eight ingredients.[216] Some of the ingredients overlap with those given by Dioscorides and Plutarch quoting Manetho, and the anonymous authors of the magical papyri indicate that by the fourth century, some *kyphi* recipes had become known by the more specific *chrismata*, perhaps to suggest their medical use as oily unguents and incenses, but not as drinks or an "edible" drug.[217] Yet the compiler of the papyrus can assume his reader would "know" the ingredients of this complicated incense-salve, and Oribasius and Paul seem to presume an equivalence of *kyphi* with *krisma*, which may indicate that the *kyphi* label had, indeed, become the more "Hellenic" *krisma* outside Egypt. The function, however, of the late Roman and early Byzantine *kyphichrismata* generally followed the hallowed Egyptian pattern, while adding an ever more impressive array of ingredients, exotic and local. Paul III, 28.2, is illustrative:

Another incense-salve of 28 ingredients, called "the lunar"

- 7 *ounkiai* [c. 191 grams] of *bdellion*: bdellium, either the aromatic gum of the Haddi tree, or, the bdellium of the Mukul "myrrh" tree (*Commiphora erythraea* Engl. var. *glabrescens* Engl., or, *C. mukul* Engl.)
- 7 *ounkiai* of *helenion*: either calamint [= basil thyme], or elecampane [= horseheal] (either *Satureja calamintha* [L.] Scheele, or *Inula helenium* L.)
- 2 *ounkiai* [c. 55 grams] of *schoinos*: camel grass (*Cymbopogon schoenanthus* Spreng.)
- 5 *ounkiai* [c. 136 grams] of *sphagnos*: horehound [= false dittany] (*Ballota acetabulosa* [L.] Bentham)
- 50 small juniper berries (*arkeuthides mikrai*): *Juniperus communis* L.
- 5 *ounkiai* of *kardamōmon*: cardamon (*Elettaria cardamomum* [L.] Maton.)
- 7 *ounkiai* of *aspalathos*: camel's thorn oil (*Alhagi maurorum* Medik.)
- 5 *ounkiai* of *kassia syrinx*: cassia "quill" (*Cinnamomum cassia* Blume.)
- 2 *ounkiai* of *nardostachys*: spikenard oil (*Nardostachys jatamansi* DC)
- 5 *ounkiai* of *kyperos*: nut grass (*Cyperus rotundus* L.)
- 4 *ounkiai* [c. 109 grams] of *asphodelos rhiza*: asphodel root (*Asphodelus ramosus* L.)
- 4 *ounkiai* of *brathu*: savin (*Juniperus sabina* L.)
- 3 *ounkiai* of *kyparissos* (*sperma*): cypress seeds (*Cupressus sempervirens* L.)
- 3 *ounkiai*. [c. 82 grams] of *nardos Keltikē*: valerian (*Valeriana celtica* L.)
- 3 *ounkiai* of *malabathron* (*meta tōn phyllōn*): Indian cassia + leaves (*Cinnamomum tamala* [Buch.-Ham] Nees. & Eberm.)
- 3 *ounkiai* of *rhoda xēra*: dried roses (prob. *Rosa gallica* L.)
- 2 *ounkiai* of *kostos*: costus (*Saussurea lappa* C. B. Clarke)
- 2 *ounkiai* of *krokos*: saffron crocus (*Crocus sativus* L.)
- 7 *ounkiai* of *ladanon*: gum labdanum (*Cistus ladaniferus* L.)
- 7 *ounkiai* of *symrna*: myrrh (*Commiphora myrrha* [Nees.] Engl.)
- 2 *litrai* [c. 655 grams] of *staphis* (*enkigartistheisos*): pitted, dried grapes = raisins (prob. *Vitis vinifera* L.)
- 2 *litrai* of *ischas liparos*: dried, fat figs (*Ficus carica* L.)
- 8 *ounkiai* of *strobilos*: kernels of the stone pine (prob. *Pineus pinea* L.)
- 1 *litra* [c. 327 grams] of *terebinthinē*: Chian turpentine from terebinth (*Pistacia terebinthus* L.)
- 7 *ounkiai* of *styrax*: storax gum (*Styrax officinalis* L.)
- 1 *litra* of *phoinikoi liparoi*: dates of the date palm (*Phoenix dactylifera* L.)
- 5 *litrai* of *meli*: honey [c. one and two-thirds kilograms]

oinos euōdes to akroun: fragrant wine as is sufficient

Oribasius' "lunar salve" has almost all of the same ingredients and measures as seen here in Paul's

[209] Plutarch, *Moralia: Isis and Osiris* 383E(80).

[210] *Suda*, M no. 142 (ed. Adler, Vol. III, p. 318).

[211] Thus this is Frg. no. 87 in W. G. Waddell, ed. and trans., *Manetho* (Cambridge, Mass., 1940 [Loeb: in vol. *Manetho. Ptolemy: Tetrabiblos*], pp. 202–5).

[212] G. Ebers, "Ein Kyphirecept aus dem Papyros Ebers," *Zeitschrift für ägyptische Sprache und Altertumskunde*, 12 (1874), 106–11. Further reffs. in J. G. Griffiths, ed., with trans. and comm., *Plutarch's De Iside et Osiride* (Cambridge [for Univ. Wales Press], 1970), 569 n. 4.

[213] Plutarch, *Moralia: Isis and Osiris* 384B(80): τῷ δὲ κῦφι χρῶνται καὶ πώματι καὶ χρίματι.

[214] *PGM*, VII, 873.

[215] Oribasius, *Synopsis for Eustathius* III, 220 (ed. Raeder, p. 121).

[216] Paul of Aegina VII, 22.5 (ed. Heiberg, II, p. 394).

[217] Cf. Galen, *Hygiene* VI, 4.6 (ed. Koch [n. 109 above], p. 177).

recipe: Paul has added only the gum labdanum, saffron crocus, and the Indian cassia. One can presume that once mixed, this salve-incense would be doled out carefully and would have lasted for several months.

Paul VII, 22.1 (ed. Heiberg, II, p. 393) makes it clear that early Byzantine pharmacy placed the *kyphi* among perfumes, but he also tells us that the aromatic function is a minor one for especially the *kyphi*: one uses them as drugs, to be taken internally for the production of accumulation of mucus, and as preventative measures during times of epidemics, as well as for freeing up the lungs and for liver ailments caused by cold. Following are four recipes: perfume of roses, perfume of lilies, the "Great *Kyphi*, called 'The Solar'" (36 ingredients), and the 28-ingredient "lunar *kyphi*" given above in detail. Dioscorides had been one of the first Greco-Roman physicians to recognize the usefulness of the traditional Egyptian multi-ingredient incense recipes, and the *kyphi/krismata* soon occupied an important place in Roman pharmacy, as evinced by Damocrates' poem as quoted by Galen. And Paul, in the seventh century, probably indicates why these curious, quasi-folkloric incenses should have been regarded as very useful by formal pharmaceutics: *kyphi* occupied a place between drugs prepared as lozenges to be dissolved in the mouth, and those drugs thought to be true antidotes.[218]

University of Kentucky

[218] Paul of Aegina VII, 22.1 (ed. Heiberg, II, p. 393).

Pseudo-Dioscorides' *Ex herbis femininis* and Early Medieval Medical Botany

JOHN M. RIDDLE

North Carolina State University
Raleigh, North Carolina, 27650

> Actual social change is never so great as is apparent change. Ways of belief, of expectation, of judgment and attendant emotional dispositions of like and dislike, are not easily modified after they have once taken shape.
>
> – John Dewey, *Human Nature and Conduct*

Dewey's assessment of social change can readily be applied to scientific change in the early Middle Ages. The popular herbal of an unknown late fifth- or sixth-century author reveals that medical and botanical knowledge had only undergone apparent change. The Germanic barbarians brought (or continued?) political instability, but no radical change in medical practices. Although attributed to Dioscorides, the early medieval treatise *Ex herbis femininis* is largely a new work based on Dioscorides. It reflects a higher level of medical-botanical lore than currently attributed to the era, an uncommon linguistic skill in Greek and Latin, and some degree of originality, perhaps as much as can be expected in any herbal, whatever the time.

De materia medica by Dioscorides was fully translated into five Latin books probably by the sixth century. Likewise *Ex herbis femininis* was known in the West from the sixth century, and it was by far more popular than Dioscorides' own work. The popularity is measured by the number of extant copies. The Old Latin translation of Dioscorides is found in three complete, or nearly complete, manuscripts, two of the ninth century and one of the tenth.[1] *Ex herbis femininis*, which discussed some seventy-one herbal entries, is found in twenty-nine manuscripts, the majority lavishly illustrated.[2] By contrast, over 500

1. Munich Ms. 337, s. X; Paris BN Ms. lat. 12, 955, s. IX; Paris BN Ms. lat. 9,332, s. IX.

2. A complete listing and description of these manuscripts is forthcoming in my article on Dioscorides to be published in the Catalogus Translationum et Commentariorum series. In "The Medical Literature of the Early Middle Ages: A Program and a Report of a Summer of Research in Italy," *Bull. Inst. Hist. Med.*,

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herbs were treated in Dioscorides' Greek text. Thirteen of the manuscripts of *Ex herbis femininis* are dated twelfth century or earlier. Seven are from the ninth century alone. Given the statistical probability of greater loss of earlier manuscripts than of later ones, these figures demonstrate the popularity of *Ex herbis femininis*. Its existence was known and referred to by some sixteenth-century botanists, such as Petrus Andreas Matthiolus and Johannes Sambucus, who used manuscript copies to help them identify plants in Dioscorides' Greek text. In 1896 Heinrich Kästner published a text of *Ex herbis*, its only printing, but he employed only three manuscripts and his version is defective.[3]

In some ways *Ex herbis* was superior to the Latin version of Dioscorides' work. Although shorter, it was easier to use, and the herbs *Ex herbis* discusses were more related to the flora of southern Europe; it often provides more detailed medicinal directions than *De materia medica*, and in many instances it reveals improved knowledge of pharmacy. Part of the reason for the popularity of *Ex herbis* was that it was illustrated, while the Latin Dioscorides was not. Nowadays the mention of Dioscorides' name invokes the notion of illustrated herbals. From the marvelously illuminated folios preserved in the complete Juliana Anicia Codex of about 512 A.D. to the wondrous woodcuts of Leonard Fuchs, Giorgio Liberale, and Jacob Cortusius in the sixteenth-century printed editions, Dioscorides was associated with botanical illustrations.[4] And yet during the Middle Ages the Latin text of Dioscorides was not illustrated except for some crude marginal sketches in Munich Manuscript 337 (s. IX), which may have derived from direct observation.[5]

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2 (1934), 36, Henry Sigerist said he had located "nearly fifty manuscripts of this text," but unfortunately he never published his list. Having completed a search myself, I believe Sigerist overestimated his findings.

3. Heinrich Kästner, "Pseudo-Dioscorides *De herbis femininis*," *Hermes* , *31* (1896), 578-636, using Florence, Laur. Mss. Plut. 73.16 and Plut. 41.73, and Paris, BN Ms. lat. 6362; in this article, Kästner omitted two herbs that he later added in *Hermes, 32* (1897), 160. Sigerist ("Medical Literature," p. 36) noted the need for another text.

4. Fuchs' woodcuts appear in *Historia stirpium* (Basel, 1542); Giorgio Liberale's drawings were cut by Wolfgang Meierpeck for Matthiolus' 1554 edition (Venice) of Dioscorides; and Jacob Cortusius' drawings were done for Matthiolus' 1583 edition (Venice).

5. Hermann Stadler, "Der lateinische Dioscorides der Münchener Hof-und Staatsbibliothek und die Bedeutung dieser Uebersetzung für einen Teil der mittelalterlichen Medicine," *Allgemeine medicinische Central-Zeitung, 14* (1900), 1966, suggested that the drawings derive from textual descriptions, but this seems unreasonable to me. Those descriptions are far too sketchy to provide sufficient information except when supplemented by direct observations made from nature.

Still, the association of Dioscorides with illustrated herbals during the Middle Ages is not entirely unfounded. Medieval man thought *Ex herbis femininis* was by Dioscorides and it was beautifully illustrated in most manuscript copies.

Although I will not include here an iconographical analysis of the illuminations, a few general remarks are in order. Much is written disparaging the quality of illustrations in medieval herbals: they are said to be static, crude copies of copies, to have little resemblance to real plants, and so on. Like many generalizations, these descriptions contain elements of truth, but the case is overstated. The quality of illustration varies, of course, according to the manuscript. Limited individuality appears in each illustrator's depiction of the plant as a unit – root systems, stemmation, leaf structure, and appearance, flowers and/or seeds. A comparison of the illustrations in various *Ex herbis* manuscripts with the famous Juliana Anicia Codex of Constantinople reveals that the *Ex herbis* illustrations are not related to those in this version of the Greek text of Dioscorides. It must be left to others to determine whether the author of *Ex herbis* drew on a classical tradition for his drawings, as seems likely, or whether he caused the plants to be drawn for his own purpose. This much I feel some confidence in stating: if one already has some knowledge of plants, one can use many of the drawings in order to make a reasonable identification of some of the plants in the field. Since neither Dioscorides nor the author of *Ex herbis* gives detailed plant descriptions, the user must have had prior knowledge of plants. *Ex herbis* was no primer for a novice medical apprentice sent by his master to replenish the jars or for a monk on his initial assignment to infirmary duty. More to the purpose, *Ex herbis* probably extended knowledge and uses of plants on the part of medieval medical practitioners. When a generic name seems reasonably clear, one should not be unduly distressed by the difficulties of determining exactly which species is depicted in either the drawings or the text. The chemical compositions of various related species tend to have approximately the same pharmaceutical actions. The author's object was medical, not botanical.

The chapter on sage (*Ex herbis*, 4; see the table in the Appendix) demonstrates the difficulty in determining from the illustrations and text exactly what species, if any, was intended. Initially, the modern untrained eye might recognize sage even from the manuscript drawing.[6]

6. *Ex herbis* describes sage as "multos ex uno cespite stirpes mittit tetragonos et subalbidos. Folia habet mali cydonei [Greek: *μηλέᾳ κυδωνίᾳ*] similia, nisi quod angustiora et longiora et subaspera, odore suavi et gravi." Thus the leaves

But on closer inspection one can see a leaf arrangement impossible in nature. One stem has an alternate or spiral leaf arrangement that is characteristic of no species of sage. But the same stem also has parts of leaves arranged opposite each other, that is, two leaves at a node; this is characteristic of several species of sage, including *Salvia officinalis*, or common sage. The same stem also has three leaves on a single lobe, (See Figs. 1 and 2). Was the artist's intention to draw a composite of different species of sage? Probably. Still this does not explain the single, alternately arranged leaves on the one stem. Might it be that somebody brought the artist a plant from the garden that had had some of the leaves plucked off? If so, the artist would no doubt have seen, and depicted, these varieties of leaf arrangement on a single stem. There was no imperative, so far as I know, for the herbalist or artist to study only unaltered plants. He would know them as he encountered them. We have no means of knowing exactly what happened, of course; but we can be reasonably sure that this particular drawing, when included with the written description of the plant's appearance and uses, would enable a practitioner to identify and use the herb. Whether the user could distinguish among the species of sage is, in this case at least, unimportant. For medical botany, all the species would be used the same way.

Copies of *Ex herbis femininis* follow Pseudo-Apuleius' illustrated *Herbarius* in many manuscripts, and a few combine the two works by running the chapters continuously and without attribution to Dioscorides.[7] Sometimes a manuscript copyist selected chapters from *Ex herbis* and interspersed them with sections of Pseudo-Apuleius' work.[8] Pseudo-Apuleius' *Herbarius* illustrates some 130 herbs and

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are described partly through analogy with the leaves of *Malus cydoneus*, but *Malus cydoneus* is otherwise not discussed by Dioscorides. The color description *subalbidus*, or "off-white," refers to the stem. Curiously, sage's purple or violet flowers are neither described nor drawn, although flowers are often described by both Dioscorides and *Ex herbis*.

7. Examples of *Ex herbis'* following Pseudo-Apuleius are: Cambridge, Trinity Col. Ms. 0.2.48, s. XIV; Florence, Laur. Ms. Plut. 73.41, s. IX; Florence, laur. Ms. Plut. 73.16, s. XIII; London, Brit. Lib. Ms. Add. 8928, s. X; London, Brit. Lib. Ms. Harley 5294, s. XII; London, Brit. Lib. Ms. Sloane 1975, s. XII; Vienna, NB Ms. 93, s. XIII. Those manuscripts that combine the two works continuously are: London, British Lib. Ms. Harley 5294, which has *Ex herbis* as chap's. 141–221, and Oxford, Bodl. Ms. 130, s. XI, fols. 57-66.

8. Paris, BN Ms. lat. 6862, s. IX; Leiden, Univ. Lib. Ms. B.P.L. 1283, s. XV (with material from other sources as well); Paris, BN Ms. lat. 13,955, s. IX; St. Gallen, Stiftsbibliothek Ms. 751, s. IX, pp. 339-340.

probably was produced in the fourth century.[9] *Ex herbis* probably was written a century or two later, as will be discussed below. There is some affinity between the illustrations in these two works, which may be expected whenever both were produced in the same scriptorium. Pseudo-Apuleius' procedure was to list headings under each herbal illustration by ailments, for example: "For stomach ache," "For wound," "For epilepsy." Both Pseudo-Apuleius' *Herbarius* and Pseudo-Dioscorides' *Ex herbis* discuss the same herb in some cases, but both the illustrations and medical uses are different. Rubrics and closings to some Pseudo-Apuleius manuscripts provide some evidence for associating the two tracts: Pseudo-Apuleius' *Herbarius* is referred to as being for masculine herbs.[10] Now undoubtedly the unknown authors of both herbals worked independently, at separate times, but later some man-scriptorium combined the two. The copyist, simplistically and incorrectly, said that one was an herbal of masculine herbs, the other of feminine herbs. In time, *male* was dropped from the title of Pseudo-Apuleius' herbal, but Pseudo-Dioscorides' work retained the designation female.

Is there any reason to call the herbs female? The ancients had a very loose classification system for ascribing sexual gender to plants and even to stones. In general, male plants were considered harder, rougher, drier, and more barren, whereas female plants were softer, smoother, moister, and more fruitful. Theophrastus, for instance, advanced reasons for ascribing sex to trees: female trees are usually fruit bearing, although some male trees also bear fruit;[11] and in some cases, he declared trees were male because of their hardiness.[12] Pliny

9. Charles Singer, "The Herbal in Antiquity and Its Transmission to Later Ages," *Hellenic Stud., 47* (1927), 38; Ernest Howald and Henry Sigerist, eds. of Pseudo-Apuleius in *Antonii Musae . . . , Pseudo-Apulei . . .* , Corpus Medicorum Latinorum, vol. IV (Leipzig: B. G. Teubner, 1927), pp. xvii-xxi. Singer's view that Pseudo-Apuleius is a Latin translation of a Greek prototype has not been generally acceptance. See Henry E. Sigerist, "Zum Herbarius Pseudo-Apulei," *Sudhoffs Archiv, 23* (1930), 197-204, esp. p. 200.

10. London, Brit. Lib. Ms. Add. 8928, s. X, fol. 19: *Ex herbis masculinis*; see Augusto Beccaria, *I codici di medicina del periodo presalernitano (secoli IX, X et XI)* (Rome: Edizioni di storia e letteratura, 1956), p. 270.

11. Theophrastus, *On Plants*, 1.13.5, 2.7.4, 3.8.9; Albertus Magnus, *On Plants*, I, tr. 1, chap. 7; see notes and references by Edward Grant, *A Source Book of Medieval Science* (Cambridge, Mass.: Harvard University Press, 1974), p. 691. An important new study John Scarborough, "Theophrastus on Herbals and Herbal Remedies," *J. His. Biol., 11* (1978), 353-385.

12. Theophrastus, *On Plants*, 3.9.3.

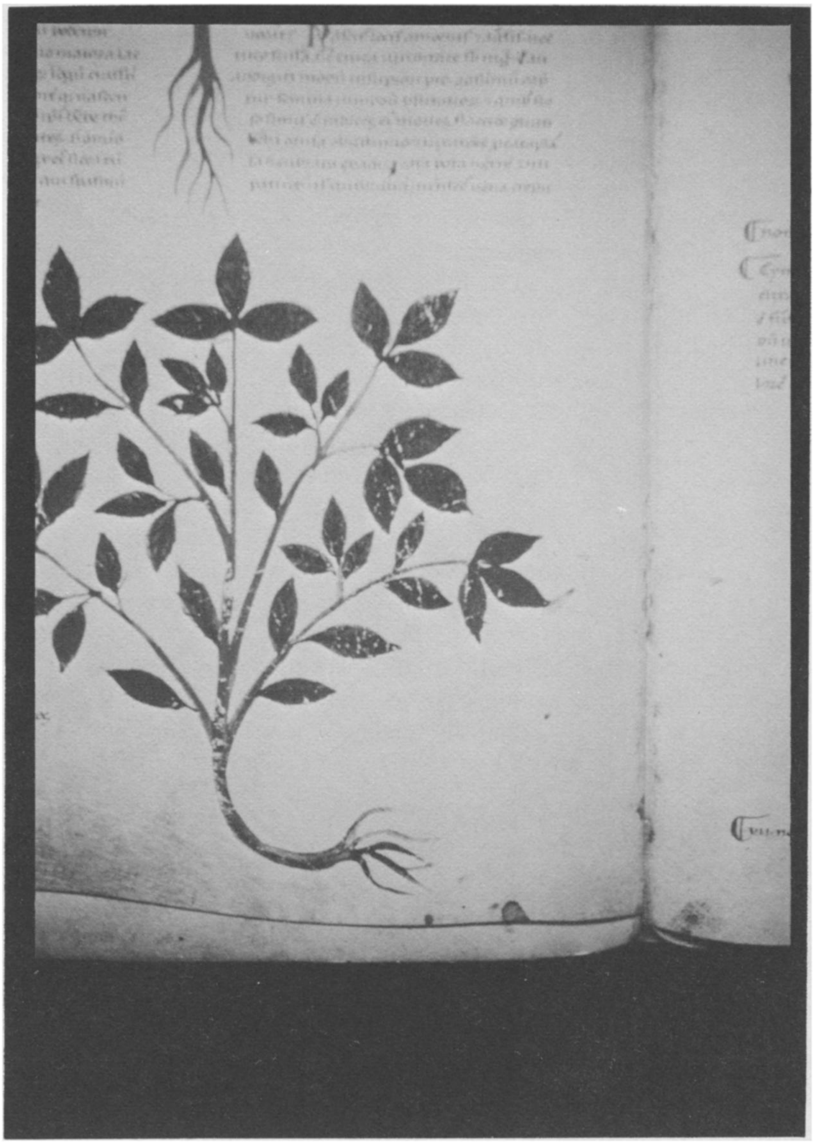

Fig. 1. The illustration of sage in the *Ex herbis femininis* manuscript in Vienna's Nationalibliothek (Ms. 93, s. XIII, fol. 137v).

Fig. 2. Detail of Fig. 1.

used the terms loosely to distinguish varieties of the same plant family. He called a kind of knotgrass male because it has more seeds,[13] and called one kind of tarragon female because it is less hard than the male tarragon and is easier to cook.[14] Dioscorides occasionally attached sexual labels to plants, but without advancing reasons for them. Similarly *Ex herbis femininis* did not provide and explanation of plant gender. Among the seventy-one herbal entries, *Ex herbis femininis* has five (nos. 12, 21, 22, 23, and 70)[15] that name both male and female varieties, but often with the statement that both have the same medicinal strength. The female mercury plant (no. 22) has seeds growing in clusters, *Ex herbis* noted, while the male's seeds grow from the stem. In only two entries (nos. 15 and 45) are the plants listed as being female. In one of these, "*dracontea feminia*" (no. 45), Dioscorides distinguished both larger and smaller varieties, whereas *Ex herbis* borrowed Dioscorides' description of the smaller plant without mentioning the larger, and called the plant female.

One twelfth-century manuscript copy gave the title of Pseudo-Dioscorides' tract as *De herbis mulieribus* and included the colophon: "Explicit atque proficitur liber medicinarum Dioscoridis ex herbis masculinis atque de herbis femininis sive seminінis. Feliciter."[16] Thus at least one copyist, at some time in or before the twelfth century, wanted the treatise's title to be "Women's Herbs" rather than "Female Herbs," but also he let it known, through design or error, that it was concerned with both male and female, or seed-producing, herbs. *Semininis* is presumably meant to be *seminariis*.

In other versions *Ex herbis femininis* has two separate chapters on Mediterranean mezereon: in the first (no. 34) the plant is designated female; the other chapter (no. 42) says there are seven kinds of mezereon, but it distinguishes only male and female forms. The drawings in each chapter show two different plants[17] and the texts list different usages.

13. Pliny, *Natural History*, 27.91.113-117.

14. Ibid., 24.92.143.

15. I have followed the manuscript numbering system, especially that in Vienna Ms. 93, rather than the numbering in Kästner's published text because of his omissions of two herbs and his slightly different arrangement. See the Appendix for herbs, with Dioscorides' chapter numbers included.

16. London, Brit. Lib. Ms. Sloane 1975, fol. 73.

17. The drawings in *Ex herbis* in Vienna, NB Ms. lat. 93, fol. 147, showing titmallos (no. 34), are similar to those in the Greek Dioscorides in Vienna, NB Ms. Gr. 1, fol. 350, showing *τιθυμαλλον ηλιοσκοπιος*; but there is less similarity between Ms. lat. 93, fol. 149, showing titmallos (no. 42), and Ms. Gr. 1, fol. 351, showing *τιθυμαλλον η οξυφυλλον*.

There seems no adequate explanation of why *Ex herbis femininis* is so named. To say that the gender designation was employed occasionally to distinguish varieties is to ignore the numerous other instances when no attempt was made to differentiate varieties even among closely related herbs. Obviously, sexual labels were not systematically applied. One can only presume that the title was the product of a later copyist who sought to connect the herbals of Pseudo-Apuleius and Pseudo-Dioscorides by designating one male, the other female.

If we know then that the Pseudo-Apuleius and Pseudo-Dioscorides treatises were herbals falsely attributed to classical writers, what can we learn about when these attributions were first made? And, in the case of Pseudo-Dioscorides, was the authorship ascribed to Dioscorides at the period of the herbal's writing or later? Some manuscripts containing these herbals also include other tracts that may help answer these questions. These other tracts are Pseudo-Hippocrates' *Epistula ad Maecenatem*, Pseudo-Antonius Musa's *De herba vettonica*, (Pseudo-?) Sextus Placitus' *Liber medicinae ex animalibus, pecoribus et bestiis vel avibus*, and the anonymous *De taxone liber.*[18] In the case of each, except the last and possibly the obscure work by Sextus Placitus, the name of a known classical authority was attached. Probably this was done to lend authority and prestige and to forestall criticism. In our age, which extols uniqueness and novelty, it is difficult to imagine an age in which uniqueness was so undesirable that authors of original works scrupulously avoided claims of innovation and often went to the extent of obscuring their authorship. Just as the names of Hippocrates and Antonius Musa were attached to tracts to lend them authority, Dioscorides' name was no doubt added to *Ex herbis femininis* because he was the author of the largest work on materia medica written during antiquity. Similarly, Linda Voigts's recent argument is persuasive that Apuleius' name was attached to the *Herbarium Apulei* because of an association between Apuleius and the cult of Aesculapius.[19]

Gerhard Baader uses the term *Herbariencorpus* to describe these six treatises – *Ex herbis femininis* and the five mentioned above – associated in manuscripts, and places their association as a corpus "in and around

18. See the manuscripts described by Beccaria, *I codici*, index.

19. Linda Voigts's "The Significance of the Name Apuleius to the *Herbarium Apulei*," *Bull. Hist. Med., 52* (1978), 214-227, with excellent references to the controversy and related questions.

Ravenna" in the sixth and seventh centuries.[20] As Pierre Riché has observed, Ravenna in the sixth century was noted as a medical center – at least, it was where physicians were "particularly honored."[21] Possibly Dioscorides' name was attached then and there to *Ex herbis femininis*.

But this tells us nothing about the origin of *Ex herbis femininis*. It is uncertain when or where the unknown author lived, what sources other than Dioscorides he employed, when and by whom the drawings were made, and why the herbs were called female in the first place. These are an embarrassingly large number of unknowns for a work once so popular and highly influential. Varieties of evidence provide some tentative answers.

Several scholars have made suggestions about the time and place the writer lived. Hermann Stadler, for instance, postulated an African origin for the author on the basis of two African synonyms he added to Dioscorides' text: "Anchusae genera sunt duo; una quam Afri barbatam vocant est" and "Cynosbatos Latini zizfum agrestum dicunt, Punici didacholbat vocant."[22] Indeed, though I will later reject Stadler's argument, there are additional African synonyms in other chapters: "Colocinthis agria, id est cucurbita agrestis, quam Afri gelelam vocant" and "Eryngion quam Afri cherdan vocant."[23] I asked Gordon Newby, an Islamicist, for his advice on these allegedly "African" and Punic words, and I quote his reply:

> Re: "Colocinthis agria. id est cucurbita grestis, quam Afri gelelam vocant . . ."
>
> The problem of the identification of the African words in the *Ex herbis* is complicated by several factors. In the first instance, a distinction is apparently made between "Punic" and "African." It is

20. See Gerhard Baader, "Die Anfange der medizinischen Ausbildung in Abendland bis 1100," *La scuola nell' occidente latino dell' alto medioevo*, 2 vols. (Spoleto, 1972), II, 669-772, esp. 697; and also his earlier article, "Zur Überlieferung der lateinischen medizinischen Literatur des frühen Mittelalters," *Forschung, Praxis, Fortbildung. Organ für die gesamte praktische und theoretische Medizin*, *17*, pt. 4 (1966), 139-141.

21. Pierre Riché, *Education and Culture in the Barbarian West from the Sixth through the Eighth Century*, trans. John J. Contreni (Columbia, S.C.: University of South Carolina Press, 1976), p. 70.

22. Hermann Stadler, "Dioscorides als Quelle Isidors," *Archiv für lateinische Lexikographie und Grammatik*, *10* (1898), 411; Max Wellmann, "Dioskurides" (no. 12), in Pauly Wissowa, *Real-Encyclopädie der klassichen Altertumwissenschaft* (Stuttgart, 1903), V, pt. 1, 1134.

23. *Ex herbis*, nos. 47 and 54 (Kästner's nos. 46 and 53).

possible that this distinction is between the Northwest Semitic Phoenician dialect called Punic, but which varies little from its Mediterranean counterpart, and a dialect of one of the Hamitic Berber languages. If it is the case, as has been assumed, that the vocabulary designated "Punic" and "African" in *Ex herbis* derived through a literary source, then it is most probable that the distinction is artificial. Fifth century North African literate culture was primarily confined to the Mediterranean littoral with occasional incursions into the interior. We know that this population area was bilingual, at least, in Latin and Punic from Roman times and that the third major linguistic influence was Greek. Punic speakers survived in force into the fifth century as St. Augustine's Punic preferments demonstrate, so it is reasonable to assume that the term "African" could include Punic, as well as Latin, Greek, and, unlikely, Berber vocabulary, lacking evidence to the contrary. The second complication concerns the transmission of foreign words in a Latin textual tradition where it cannot be assumed that the original author or the subsequent transmitters were acquainted with the African language(s) in question. While we cannot be certain that the form of the words in our extant versions of *Ex herbis* is correct, any hypothetical etymology is subject to correction by a demonstration of a more valid textual tradition. The third difficulty involves our relative lack of knowledge of Punic, or Berber, for that matter, particularly in the realm of plant names. Most of our Punic vocabulary lists are derived from monumental inscriptions and from the Punic passages in Plautus. Decipherment of texts often rests on the ability of the scholar to find plausible analogs in other Semitic languages, relying on context to provide exact definitions.

In light of the above, it is possible to propose an etymology for one of the terms labeled "African" in *Ex herbis*, the term "*gelelam*." This is the "African equivalent of "*cucurbita*" gourd or cupping glass. If one assumes a root *GLL, a geminated form of *GL, one finds a Northwest Semitic analog, Aramaic *gelâl*, a lump, *gâlâl* (v.) to roll, *gâlâm* (v.) to roll up, and, in a reduplicative expansion of *GL, *galgêl* (v.) to roll. (M. Jastrow, *A Dictionary of the Targumim* . . ., New York, 1950, v. I). The semantic range of this root is paralleled in Arabic, cf. *jalla* and *juljul*. The semantic range of "roundness" parallels that of "*cucurbita*" and would seem to be apt in Semitic. If this be the case, it is possible that the terms "Punic" and "African" in *Ex herbis* overlap if not coincide, and it is probable that there was a genuine North African origin for the terms so named.

Under "red bulbs" (no. 44), however, the author of *Ex herbis* omitted Dioscorides' statement that they are "brought from Africa."[24] Under wild colocynth or bitter apple (no. 47), where *Ex herbis'* author gives the African synonym *gelelam*, he added that it has spread *per terram*, "throughout the earth."[25]

But the herbs listed in the treatise come from a southern European habitat, not an African one. Charles Singer, citing an apparently erroneous reference, reports that the author of *Ex herbis* may have lived in Ostrogothic Italy, but gives no reasons for this assertion.[26] Evidence presented in this paper supports the thesis that *Ex herbis'* author lived in Italy, southern France, or the Mediterranean littoral of Spain, probably in the fifth century, although an early sixth-century date seems possible. The 600 or so plants described by Dioscorides are preponderantly from the eastern Mediterranean regions.[27] The author of *Ex herbis* selected some seventy herbs (two chapters discuss the same plant). Difficult though it is to prove, the evidence suggests a southern European location for the plants described.

Botanical identification of the herbs according to modern classification is difficult. Descriptions are often vague or even lacking, and the drawings, as noted earlier, are often not accurate. Plants change their habitats and cultivation extends growth areas. Pilgrims, merchants, and traveling monks, especially those monks responsible for monastic herb gardens, could be expected to extend medicinal herbs to regions where the plants were not native.[28] Whereas the climate during Dioscorides'

24. *De materia medica*, 2.170 (vol. I, p. 236, Wellmann ed.).

25. *Per terram* might instead mean "on the ground," but the Old English version of *Ex herbis* (no. 185 in Thomas Oswalk Cockayne, *Leechdoms, Wort-cunning, and Starcraft of Early England*, 3 vols. [London 1864-1866; repr. London: Holland Press, 1961], I, 325) translates the words *per terram* as "spreadth abroad its stems upon the earth." P. Font y Quer, *Plantes medicinales el Dioscorides renovado* (Barcelona: Editorial Labor, 1962), p. 770, says wild colocynth was not introduced to Europe until the Arabs brought it through Spain. My interpretation of *Ex herbis* would place the plant's introduction sooner.

26. Singer, "Herbal in Antiquity," p. 47, cites as his authority Max Wellmann, "Krateus," in *Abhandlungen der königlichen Gesellschaft der Wissenschaften zu Göttingen: Philologisch-Historische Klasse*, n.s. *2*, no. 1 (1900), but without pagination. I am unable to find Wellmann's statement.

27. C. Vaczy, "Nomenclature Dacica a plantelor la Dioscorides si Pseudo-Apuleius," *Acta Musei Napocensise* (Clui, Transylvania), *5* (1968), 59-73, esp. pp. 68-69; Jerry Stannard, "Medieval Herbals and their Development," *Clio Medica*, *9* (1974), 24.

28. Linda E. Voigts, "Anglo-Saxon Plant Remedies and the Anglo-Saxons," *Isis*, *70* (1979), 259-261.

time (first century A.D.) was approximately the same as today's climate, and the vegetation found in both periods is similar,[29] a variety of evidence points to the likelihood that climate was different in the late Roman and early medieval periods. From the second century A.D. to about 350 A.D. the climate in Italy was rather moist; there followed a drier period to about 450, with dry periods repeated around 800 and in the nine hundreds.[30] Evidence derived from the Fernau glacier, analyses of pollen indicating growth and recession of forests near peat bogs, changes in crop and vineyard growth areas, dendroclimatology, and other data suggest that from 300 to 500 A.D. there were warm summer periods accompanied by generally dry and cold winters in the area of Europe around near 50° N. Similar periods were repeated in the ninth and tenth centuries, and the years from 1000 to 1200 are associated with a moderate, warm climate and optimal growing conditions.[31] Linda Voigts has speculated on the basis of literary and climatological evidence that the erratic early medieval climate may have affected the kinds of crops and herbs cultivated in Anglo-Saxon England.[32] We may project similar patterns in vegetation changes throughout Europe. A further problem in botanical identification is that nomenclature shifts. The word used to refer to a plant in one era may not refer to the same plant in another.

But even with these problems, many identifications can be made with reasonable certitude. In the list of plants in *Ex herbis* there is no exception to this rule: where identification seems at least fairly certain the plants have southwestern Europe as a natural habitat. A few have wet, moist plains as their home, while some have mountains, for instance, the Alps or the Pyrenees. Proposing a north African origin for *Ex herbis* is therefore almost certainly incorrect. Its author was

29. Charles E. P. Brooks, *Climate through the Ages*, 2nd ed., rev. (New York: Dover, 1970), esp. pp. 300, 310ff; H. H. Lamb, *The English Climate*, 2nd ed. (London: English Universities Press, 1964), p. 162; Robin Birley, "A Frontier Post in Roman Britain," *Sci. Amer.*, *236* (February 1977), 44.

30. H. H. Lamb, *Climate: Present, Past, and Future*, 2 vols., vol. II, *Climatic History and the Future* (London: Methuen, 1977), pp. 426-429; Brooks, *Climate through the Ages*, pp. 300-301.

31. Brooks, *Climate through the Ages*, pp. 310-311; Georges Duby, *The Early Growth of the European Economy*, trans. Howard B. Clarke (Ithaca: Cornell University Press, 1974), pp. 6-11; Jean Gimpel, *The Medieval Machine: The Industrial Revolution of the Middle Ages* (New York: Holt, Rinehart and Winston, 1976), pp. 30-32; Lamb, *Climatic History*, pp. 34-40, 426-429.

32. Voigts, "Anglo-Saxon Plant Remedies," pp. 261-263.

selecting herbs, those most readily available in his region, that were most useful in medicine.

Other evidence supports my contention. A copyist of Pseudo-Apuleius' *Herbarius* omitted some plants that were not grown in Central Europe, where he was copying the manuscript. For those plants he substituted plants locally grown.[33] Further, an eleventh-century copy of an Old English translation of selected chapters from *Ex herbis femininis* reveals that an unknown Old English author-translator altered his material and in some cases seems to be discussing plants different from those in *Ex herbis.*[34] Presumably, he made these changes to suit the botanical characteristics of his region.

If *Ex herbis* was written in southern Europe, when did the author live? Three pieces of evidence support the contention that the herbal was in existence by the sixth century: (1) a statement by Cassiodorus; (2) an anonymous letter, perhaps by Cassiodorus; (3) Isidore of Seville's use of *Ex herbis*.

Writing not later than 562 A.D., Cassiodorus advised some monks: "If you have not sufficient facility in reading Greek, then you can turn to the herbal of Dioscorides, which describes and draws the herbs of the field with wonderful faithfulness."[35] This quotation usually cited as evidence that the Old Latin translation of Dioscorides' full five books was completed by Cassiodorus' time; to this manuscript Cassiodorus allegedly advised the deplorably ill-trained monks to turn. More probably, however, Cassiodorus was referring them to Pseudo-Dioscorides' *Ex herbis femininis*. As observed earlier, manuscripts of Dioscorides' old translation are not normally illustrated, and Cassiodorous' reference was to work that was "drawn with wonderful faithfulness." Moreover,

33. Sigerist, "Medical Literature," p. 34; Erhard Landgraf, "Ein frühmittelalterlicher Botanicus," *Kyklos, 1* (1928), 3–36.

34. As shown in the Cockayne ed., and as noted in the Appendix. Hubert Jan de Vriend, *The Old English Medicina de quadrupedibus* (Tilburg: D. U. H. Gianotten, 1972), observes numerous instances of modifications and misunderstandings by the Old English translator(s) of this work attributed to Sextus Placitus. In the case of one manuscript, Oxford, Bodl. Ms. 130, which contains fragments of the Latin *Ex herbis femininis*, he sees evidence that the *Medicina de quadrupedibus* section may be a translation, at least in part, back into Latin from the Old English and one made by "a translator who did not know Old English very well" (p. xlv). I have compared the fragments of *Ex herbis* in Bodl. Ms. 130 with other texts and can report that they reveal no signs of being a Latin translation of the Old English.

35. Cassiodorus, *Institutiones divinarum et humanorum litterarum*, chap. 31.

he used the word for herbal. Dioscorides' text, usually called *De materia medica*, described items from all three kingdoms, animal, vegetable, and mineral, and thus was not restricted to herbs. This argument is not completely firm, however, because in rare instances during the Middle Ages Dioscorides' complete text was referred to as an herbal.[36] Nonetheless, Cassiodorus was probably referring to *Ex herbis femininis*.

An anonymous letter to Marcellinus is found in two manuscripts, one of the twelfth century, the other of the ninth. The letter reads:

> With you as I may say with all good art which has not been studied [in our age] in the old manner because it (that is, learning) is subject to change among us, Marcellinus, I send you the best known, little botanical book from Dioscorides' book, converted into Latin, and in which are drawn herbal figures. I commend not only the pleasing fidelity of the writing to you but also on both sides of the folios it is carefully described so that one may not make errors about what the herbs are, neither will they misjudge their healing qualities nor will they missidentify their varieties.[37]

In both manuscripts, the letter follows Pseudo-Apuleius's *Herbarius*. I observed above that in many other codices *Ex herbis femininis* follows Pseudo-Apuleius. Although the suggestion was made by Max Wellmann and Valentin Rose that Marcellinus is the same as Gargilius Martialis (flourished c. 222-235), the earliest-known Latin author to cite Dioscorides,[38] it seems too much to expect *Martialis* to become *Marcellinus*. I advance this possibility: The letter was written by Cassiodorus to Marcellinus (flourished c. 534), the secretary of the patrician Justinian who continued Eusebius' chronicles to the beginning

36. E.g., one copy of the Old Latin translation has the title *De virtutibus herbarum*. See Paris, BN MS lat. 12,995, s. IX, fol. 1.

37. The letter is found in London, Brit. Lib. Ms. Harley 4986, s. XII (variously dated from s. X), fol. 44v, and was published from this manuscript by Valentin Rose, "Ueber die Medicina Plinii," *Hermes, 8* (1874), 38; cf. Beccaria, *I codici*, pp. 252-254. The letter also appears in Lucca, Biblioteca Governative Ms. 296, fol. 18v, and published in part by P. Giacosa, *Magistri Salernitani nondum editi* (Turin, 1901), p. 351. Giacosa identifies part of the text as by Dioscorides, but it was not so identified by Beccaria (pp. 285-288). The letter is published from both manuscripts by de Vriend, *Old English Medicina*, pp. xlii-xliii, who verifies that Giacosa was correct in recognizing *Ex herbis* in the Lucca Ms.

38. Wellmann, "Dioskurides," pp. 1134-1135; Rose, "Medicina Plinii," p. 38.

of Emperor Justinian's rule.[39] The reference is to *Ex herbis femininis* because of (1) its location in the two manuscripts; (2) the words *libellum botanicon*, instead of *materia medica*; and (3) again the mention of illustrations. Finally from my interpretation of the other Cassiodorus quotation, I believe that Cassiodorus knew and appreciated *Ex herbis*.

Valentin Rose proposed that Isidore of Seville (c. 560-636) used *Ex herbis* as a direct source for his botanical discussions in *Origines*, Book 17, Chapters 7-11.[40] Rose compared the wording of Isidore's text for "bupthalmos" with the text for "bustalmon" in *Ex herbis* (no. 30). Herman Stadler pursued the suggestion by comparing other entries and noted the resemblance of the two texts in discussing "aristolochia" (no. 12), "celedonie" (no. 18), and "colocinthios" (no. 47). To the lists by Rose and Stadler can be added "buglossos" (no. 2; cf. Isidore 7.10.20). Stadler categorically rejected any assertion that *Ex herbis* is an extract of Isidore.[41] Even though Isidore based most of his botanical research on Pliny's *Natural History*,[42] the case is strong that Isidore knew the Pseudo-Dioscoridean text. Compared with Isidore's work, *Ex herbis* has much more information concerning the herbs, information that is known from no other identified source. Thus the author of *Ex herbis* did not use Isidore's *Origines* as his source; instead Isidore employed *Ex herbis* when he wrote early in the seventh century. Rose's suggestion is correct.

Ex herbis' language suggests late classical, early medieval Latin, that is, a date around the fifth century. The author unquestionably knew his languages well. There are a few examples of barbarisms, but far

39. Cassiodorus, *Letters*, 1.17.1-2 (L. W. Jones ed.); cf. Max Manitius, *Geschichte der lateinischen Literatur des Mittelalters*, 3 vols. (Munich, 1911-1931), I, pt. 2, pp. 79, 116-117. No other letter by Cassiodorus is addressed to Marcellinus, but it is clear that Cassiodorus held him in respect. About the time Marcellinus was writing his *Chronicum*, Cassiodorus was heading a Christian school in Rome that he had founded about 535 and that survived until it was destroyed in the fighting between Totila and Belisarius in the late 540's. See Pierre Paul Courcelle, *Late Latin Writers and Their Greek Sources*, trans. Harry E. Wedeck (Cambridge, Mass.: Harvard University Press, 1969), p. 334; for Cassiodorus' knowledge of Marcellinus' work, see pp. 261n, 374, 395, and 410.

40. Rose, "Medicina Plinii," p. 38; accepted by Singer, "Herbal in Antiquity," p. 47; Wellmann, "Dioskurides," p. 1134; and Lynn Thorndike, *A History of Magic and Experimental Science*, 8 vols. (New York: Macmillan, 1923-1941), I, 609.

41. Hermann Stadler, "Dioscorides als Quelle Isidors," *Archiv f. lat. Lex. u. Gram.*, *10* (1898), 403-412, esp. pp. 409-410.

42. Ernest H. F. Meyer, *Geschichte der Botanik*, 4 vols. (Königsberg, 1854-1857; repr. Amsterdam: A. Asher, 1965), II, 391.

fewer than are present in the Old Latin translation of Dioscorides, which was probably made in the sixth century.[43] And there are examples of new vocabulary words.[44] These qualities, in addition to the fact that no one earlier than Cassiodorus (c. 562 A.D.) refers to *Ex herbis* and no one earlier than Isidore (c. 560-636) quotes from it, are the principal factors in postulating a fifth-century date, or at any rate a date no later than early sixth century.

The translations from Dioscorides seem to be direcly from the Greek and in short, crisp Latin. The lexical skills were quite remarkable. The translation is free and frequently interspersed with additional comments either about the plants or about their medicinal uses. Most notably, the author added details about how to prepare and compound the herbs as medicines and how to administer them that Dioscorides had not included.

Ex herbis femininis is substantially a new botanical-medical treatise and contains new medical and botanical contributions; it added to, modified, and subtracted from the Dioscoridean core. Of the seventy-one chapters, only eighteen or nineteen are translated from Dioscorides with insignificant changes.[45] In no case is the translation a complete, unmodified Latin version of Dioscorides' Greek. In some twenty-nine chapters, the author has modified the Greek text and added medicinal uses of the plants not contained in Dioscorides' work.[46] In thirteen or fourteen, the text is completely new and totally unrelated to Dioscorides or, as will be shown later, to any other known literary

43. Hermann Stadler, "Der lateinisches Dioscorides der Münchener Hof-und Staatsbibliothek und die Bedeutung dieser Uebersetzung for einen Teil der mittelalterlichen Medicin," *Janus, 4* (1899), 548-550; and same title by Stadler but different text in *Allgemeine Medicinische Central-Zeitung, 14* (1900), 165-166; *15* (1900), 179-180; Vinzenz Bulhart, "Lexikalisches zum Spätlatein," *Wiener Studien: Zeitschrift für klassische Philologie, 67* (1954), 145-161; Max Niedermann, *Recueil Max Niedermann* (Neuchâtel: Secretariat de l'Université, 1954), pp. 39-43 and passim.; H. Mihaescu, "La versione latine di Dioscoride tradizione manoscritta, critica di testo, cenno linquistico," *Ephemeris Dacoromana, 8* (1938), 298-348; Hermann Stadler, Lateinische Pflanzennamen in Dioskorides," *Archiv für lateinische Lexikographie und Grammatik, 2* (1898), 83-114.

44. For a list of barbarisms and new vocabulary in *Ex herbis*, see Kästner, "Pseudo-Dioscorides," p. 579.

45. The chapter numbers are: 7, 11, 12, 14, 15, 16, 18, 20, 23, 26, 27, 28, 30, 33, 38, 41, 48, 51, 52 (maybe unrelated?), and 71. Throughout the chapter numbers are as they appear in most manuscripts, esp. Vienna Ms. 93, since Kästner's edition omits two chapters.

46. Nos. 1, 2, 3, 4, 5, 6, 8, 9, 10, 17, 19, 21, 22, 24, 25, 29, 32, 36, 37, 40, 42, 43, 45, 54, 56, 59 (?), and 70.

source.[47] Seventeen chapters significantly modify plant descriptions. In at least three chapters, differences in plant habitat are noted.[48] In one chapter (no. 31) the identification of the herb is uncertain because of an inability to find the equivalent chapter in Dioscorides.

The chapter on sweet marjoram (no. 10) is a good example of how the author modified his material. Dioscorides said marjoram's leaves are "rough and round like catmint [*καταμίνθης*]," but *Ex herbis*' author, showing some care in translating as well as botanical knowledge, said the leaves are "rough and round, similar to *nepeta*." *Nepeta* is a variety of catmint known as Italian catmint. Rather than merely being content with transliterating the Greek to *cataminthus*, which is acceptable in Latin, the author-translator sought to identify the herb specifically by referring to a variety known in his locality. To Dioscorides' list of medicinal uses, *Ex herbis* added that the herb is useful in treating urinary complaints and a gripping pain of the intestine. Interestingly, a modern herbal by M. Grieves reports that sweet marjoram alleviates "spasms, colic, and . . . pain in dyspeptic complaints."[49] Where Dioscorides said it relieves swellings or tumors (*οἰδήματα*), *Ex herbis* was more specific: "eye tumor," *tumores oculorum*. *Ex herbis* follows Dioscorides in giving a synonym, *amaracon dicitur Cyzicenis*, but one eleventh-century copy omits this synonym and adds one of its own: *arabos dicitur herba ezuae.*[50] Perhaps even before the translations from Arabic to Latin, the copyist was adopting the text to his own time.[51]

In discussing sea holly's root (no. 54), the author said they "are collected at the summer solstice before the rising sun," material not in to Dioscorides' text, and omitted Dioscorides' claim that sea holly is a good amulet. *Ex herbis* directed that sea holly be cooked in oil until it is viscous, then placed in wax, then blended with three parts (?) of silver foam, and finally mixed with ashwood twigs. This recipe is "a wonderful aid against scorpion and all snake bites or mad dog bites if the wound is first opened by iron and it is applied locally so that the sick person does not perceive the smell. [At] this temperature [the

47. Nos. 35, 50, 57, 58, 59 (possibly), 60, 61, 62, 63, 64 (?), 65, 66, 67, and 69.

48. Nos. 8, 9, 10, 11, 23, 25, 27, 29, 33, 34, 37, 45, 51, 53, 59, 69, and 71, modify plant descriptions. Nos. 1, 5, and 11 give different plant habitats.

49. M. Grieves, *A Modern Herbal* (New York: Dover, 1971), p. 521.

50. Florence, Laur. Ms. Plut. 73.41, s. XI, fol. 91 (124).

51. John M. Riddle, "The Introduction and Use of Eastern Drugs in the Early Middle Ages," *Sudhoffs Archiv*, *49* (1965), 185-198.

formula] also cools St. Anthony's fire, and it resists gout if applied at its inception."

More typical modifications are less drastic but have some medical significance. Under hawthorn (no. 1), *Ex herbis* translated Dioscorides' statement that applied locally it is good for swellings (*οἰδήματα*) with the phrase "applied locally it removes bruises [*livores*]." Thus *Ex herbis* refined the indefinite Greek word *οἰδήματα* to read "eye tumors" in the chapter on majoram and here to read "bruises." In five chapters *Ex herbis*' author came across Dioscorides' word *ἴκτερον*, meaning jaundice; twice (nos. 30 and 53) the author simply transliterated the word into *icterícon*, while in three chapters (nos. 29, 41, and 49) he inconsistently translated it *morbum regium*. In no. 41 he explained: "morbum regium id est ictericon." Examination of his free translation reveals that the author was no novice who dealt clumsily with Greek and Latin.

His linguistic knowledge was good but, more important, his medical and botanical knowledge was sufficiently sophisticated enough to allow him often to give more detailed analyses, more precisely and medically descriptive, than those recorded by his highly regarded classical authority, Dioscorides. For instance, still under hawthorn (no. 1), Dioscorides wrote, "Thus the root being drunk is good for hematosis [*ταύτης ἡ ῥίζα πινομένη ποιεῖ πρὸς αἱμοπτυικούς*]." The author of *Ex herbis* loosely translated this as: "Thus the root, beaten and grated, taken in two spoonfuls, drunk with water, is good for hematosis . . . [Huius radix tunsa et cribrata ad modum cocliaria duo cum aqua pota obduris, haemoptoicis . . .]."

We find examples of the author's knowledge throughout the herbal. To Dioscorides' assertion that burrage (no. 2) makes one happy at parties, the author of *Ex herbis* added that its leaves perforated are a good condiment when added to food. Dioscorides said that acantha (no. 3), or bear's breech, is "useful for convulsions and ruptures [*ῥήγματι* = in sense of fractures or breaks]," which *Ex herbis* rendered as it "heals inner veins which burst open" (that is internal hemorrhaging). Dioscorides asserted only that the root is drunk; *Ex herbis* added, "The root dried, beaten and grated, drunk with water." Sage (no. 4), Dioscorides said, is good "for wounds, staunching blood and as a cleanser of malignant humors [*καὶ τραυματικὴ καὶ ἴσχαιμος καὶ ἀποκαθαρτικὴ τῶν θηριωδῶν*]." *Ex herbis* translated this as: "it stops blood from wounds, it cures old, festering bites of wild animals, and it joins together open wounds," which is really hardly a translation at all. And, to sample more at random, *Ex herbis* omitted Dioscorides' claims that if psyllium

plantain (no. 25) is brought into the house, it prevents fleas from breeding, but added that it cures a protruding umbilicus. Whereas Dioscorides said horsetails (no. 32) stop bleeding, *Ex herbis* refined the statement to read, they are "good for ruptured veins within the body and on the eyes." A preparation of ground olive's leaves cleans filthy, festering wounds, wrote Dioscorides, while *Ex herbis* (no. 39) said their use should be continued until the wound has healed. Sorrel (no. 49), *Ex herbis* said, cures cysts on the breast; Dioscorides merely mentioned cysts without giving a location. Common teasle (no. 52), "beaten, chopped up, and drunk in warm water, cures one of worm disease most perfectly," *Ex herbis* added to Dioscorides' text in another place. Not all uses discussed are medicinal. Golden thistle (no. 36) was said by both Dioscorides and *Ex herbis* to remove bad smells from the armpits – indeed the entire body – and to reduce the smell of urine. Dioscorides noted that the herb is put in asparagus, presumably to counter the smell of urine, while *Ex herbis* simply said golden thistle is a healthy food.

The early medieval writer included a number of herbs used as abortifacients and one used as a contraceptive, but he said less about these uses than Dioscorides did for the same herbs. Shepherd's purse (no. 16) was said by both Dioscorides and *Ex herbis* to abort a fetus in pregnancy.[52] Likewise ploughman's spikenard (no. 28), friar's cowl (?, no. 45), and opoponax (no. 64) cause termination of pregnancies. Germander (?, no. 8), Dioscorides said, carried off the menses and embryo, while *Ex herbis* said, "it draws out the menses and expels a dead fetus." Both say that "aristolochia" (no. 12) "expels a retained fetus [*Ex herbis*: "herentes fetus discutit"]." Strictly speaking, these herbs are probably not intended as abortifacients. There is only one clear prescription of a contraceptive and this is suspect by modern judgment. Translating Dioscorides almost literally, *Ex herbis* reported of spleenwort (no. 41): "If it does not see the moon, collected by day or night, it is suspended [around the neck] with the spleen of a mule and it does not allow one to conceive." And the unidentified herb "isfieritis" (no. 31) was named by *Ex herbis* as an aid to conception. For three herbs (nos. 45, 56, and 59), however, *Ex herbis* omitted Dioscorides' claims about abortifacient qualities. The fact that there are fewer abortifacients in the later treatise than in its model is no certain indication that early medieval medicine was less inclined than classical medicine to abortions. Other early medieval medical writings are filled

52. The Old English version of *Ex herbis* states that it provokes menstruation – Cockayne ed., no. 150, I, 275.

with abortifacients. The author of *Ex herbis* was probably indicating by his omission his judgment on the herbs' effectiveness in causing abortions.

The old idea that early medieval medical works are replete with superstitions, clarms, amulets, and magic is shattered by *Ex herbis femininis*. Although it contains some instances of what today we call supernatural elements, they are few. Only three instances are noted among the hundreds of uses of herbs. In every case, the supernatural element is taken directly from Dioscorides. In four other places *Ex herbis*' author, even when translating from Dioscorides, has omitted superstitious elements from Dioscorides' text. In material added by *Ex herbis*' author, there is no mention of the supernatural. Snapdragon (no. 23) is worn as a suspension to keep away dangers, reported both Dioscorides and *Ex herbis*. Squill (no. 53), both stated, is suspended above doorways to keep out evil spirits. And, finally, there is the prophylactic use for spleenwort (no. 41), mentioned above. *Ex herbis* omitted Dioscorides' claim that friar's cowl (?, no. 45) emits a smell from its withering flowers that will destroy a newly conceived embryo; that sorrel's (no. 49) roots worn as an amulet around the neck alleviate *struma* (goiter or scrofula); that common plantain (no. 51) similarly worn dissolves *struma*; and that sea holly (no. 54) is worn as an amulet. One case is uncertain. *Ex herbis* added to Dioscorides' account that mayweed (no. 19) portends death. Accordingly, its juice is mixed with *aegrotus* oil to determine the imminence of death: if smeared on the body of a patient and he sweats, then death is coming; if the patient "sweats to a lesser degree," then he remains "longer." In the absence of modern experimentation, one must allow for the possibility that the mixture could have some physiological effect in inducing perspiration. Whatever may be the truth about mayweed, *Ex herbis* was definitely less superstitious and supernatural than comparable classical works.

Plant descriptions also are different in *Ex herbis* and Dioscorides' treatise. Generally, *Ex herbis* shortened Dioscorides' plant descriptions, occasionally completely omitting them. It may be noted again that *Ex herbis* had an accompanying picture of each plant, whereas the Latin Dioscorides had no such aid. Even so, *Ex herbis* often modified the description. One example is psyllium plantain (no. 25). Dioscorides reads:

> Psyllium has leaves similar to *coronopis*, hairy, twigs a thumb span long, and the whole plant grasslike. The leading part is the foliage from the middle of the stalk, two or three heads on the top twisted

up, in which seeds are like fleas, the black, hard kind. It grows in the countryside [φύεται ἐν αρούραις].

Ex herbis reads:

> Psyllios. So-called because its seeds appear like fleas, the same as *cynomia*. In Latin they call the herb *pulicaria*, or fleawort. The leaf has small prickles, the stem branches, dry and fragile all over; from the middle of the stem it sends out stalks at the highest point, two or three heads in which the seed is black similar to fleas. It is found in cultivated places.

Thus *Ex herbis* says its habitat is cultivated places, while Dioscorides says its habitat is the countryside.

Elsewhere the author of *Ex herbis* also varied the habitat, presumably to suit better his time and place. Where Dioscorides mentioned Eastern habitats, *Ex herbis* omitted them (compare, for example no. 5 with Dioscorides, 3.60). Dioscorides said hawthorn (no. 1) "grows in mountainous and woody places," which *Ex herbis* rendered as "it grows in mountainous and rockly places and dry places." For cumin (no. 5) *Ex herbis* omitted Dioscorides' statement that "it grows in the hills [φύεται ἐν γευλόφοις]"; but for houseleek (no. 11), Dioscorides' phrase "It grows in hilly places and places of broken pottery" is changed in *Ex herbis* to "in mountainous places ["in locis montuosis"]."

Most plant modifications are minor. In describing germander (no. 8), *Ex herbis* added this line to Dioscorides: "From one root many branches lead out into the turf." In describing annual mercury (no. 22), Dioscorides said there is a male and a female; the seed of the female grows in thick clusters and the male has small round stems longer than the female's. *Ex herbis* stated: "The seed of the female grows in clusters, the masculine on the stem itself." In this entry, *Ex herbis* added a synonym, *hermubotane*, for the herb.

For the color of flower *Ex herbis* sometimes changed hues slightly. Dioscorides reported knotgrass (no. 9) flowers as being white and purple (φοινικοῦν = purple toward red), while *Ex herbis* translated as white and ruddy, or rosy (*roseum*). Dioscorides said snapdragon's (no. 23) flowers are purple (πορφύρα), while *Ex herbis* has rose-colored (*colore roseo*), but for wall flower and/or mountain pansy (no. 59), where Dioscorides says its flowers are white, yellow, and purple (λευκὸν

ἢ μήλινον ἢ πορφυροῦν εὑρίσκεται), *Ex herbis* accurately translates, "purple, white and yellow [*purpureum*, album et melinum]."[53]

Usually the author of *Ex herbis* transliterated Greek plant names into Latin letters, but sometimes this procedure changed the nomenclature. *Ex herbis*' "cestros" (no. 11) is not Dioscorides' κέστρον (4.1), but Dioscorides' ἀείζωον μέγα (4.88), or houseleek. To *sideritis* (no. 20), *Ex herbis* adds, "quam Afri cherdan vocant"; to *iera* (no. 55, or our vervain), *Ex herbis* adds, "quam Latini verbenam."

Fourteen or fifteen chapters in *Ex herbis* are completely different from anything in Dioscorides, even though for each of these herbs Dioscorides has a complete description of the plant and medicinal uses. The reason for this is unclear. The herbs are found throughout Dioscorides' text and in the same books as other entries from which the author of *Ex herbis* freely translated. Dioscorides included medicinal uses that were ignored in *Ex herbis*, but the sixth-century author added many new uses. Moreover, for many of the new entries the style changes. For many, not all, the style is to list ailments and then describe medicinal preparation. For heliotrope, which is either weber dandelion or chicory, *Ex herbis* has two separate, and separated, entries (nos. 35 and 50) with slightly different illustrations, but there are no descriptions to enable us to discern the differences between the plants. Entry no. 35 reads in *Ex herbis*:

> Heliotrope, so-called because its flowers turn to meet the course of the sun. By others it is called *helioscopion* and by the Romans *woods intybum*.
>
> For disease of the spleen. Take the juice of heliotrope with 17 grains of pepper for three days and you will marvel.
>
> For headache: Place the juice of the herb heliotrope with rose oil; anoint on the head and forehead.
>
> For heart-burn: Prepare it thus: ten drachmas of spice nard, thyme honey 4 drachma, 3 drachma casia, 4 drachma pepper, 4 *misces* with wine and with the juice of the aforesaid herb above, *cocliaria* 3, form in a round ball of 2 scrupula and administer in a drink in wine. It frees one.

And entry no. 50 reads in part:

53. Of course, *Ex herbis* could have employed another source here and not translated Dioscorides. Isidore (17.9.19) follows *Ex herbis*.

Heliotrope – wheresoever it is found it is neither simple nor in rows.
For warts: leaves from the highest parts and warts *inde fricabis*. With 3 parts . . . in vinegar, they suddenly fall away and they do not come back again.
For scabies of the whole body . . .
For disease of the bladder . . .

Pseudo-Apuleius's treatise has an entry on heliotrope and, although the same style of presentation is used, there is no similarity in texts.[54]

There are other examples of completely different material that *Ex herbis* added in the same style as Dioscorides, for example, "centimorbia," possibly yellow loosestrife or creeping Jenny (no. 58), and "cynosbatos," or dog rose (no. 62). It is possible in these cases that *Ex herbis*' author had an entirely different plant in mind than did Dioscorides, but Dioscorides' textual descriptions of other plants may have been his source. *Centimorbia* may be either a new plant introduced by *Ex herbis* or a new plant name. In the case of scarlet pimpernel (no. 63), the author omitted Dioscorides' description of the plant, translated two sentences from Dioscorides, and then added considerable new information. From Dioscorides he used: "Place in the nostrils, it drives away phlegm and all bad humors. It calms the toothache." He added:

> If the juice is mixed with rose oil and smeared on the face, one will look cheerfully on all things. It is effective for a light, smooth complexion on women. *Anagallis* juice, mixed with honey, Indian *lycium* and bitter vinegar, and anointed on a woman's face, makes the face clear and soft. For epileptics who have alien dispositions: The anagallis juice mixed with honey and injected in the nose by purging the head restores a balanced mental attitude to the epileptic. For removing blemishes from the head . . .

And so it goes, but where did the author get his material?

54. Pseudo-Apuleius no. 49 (pp. 99-100, Howald-Sigerist ed.): "Herba Heliotropia. 1. Ad omne venenum. Herba heliotropiae pulverem mollissimum ex ea aut sucum eius, cum vino veteri optimo potui datum mire venena discutit. 2. Ad luxum herba heliotropia contusa et adposita efficaciter sanare dicitur." There follows a nomenclature section that is thought to be a later addition: "A Graecis dicitur heliotropia, alii heliotropos. alii heliopun, aii adialiton, alii scorpion, alii Heraclea, profetae gonos scorpiu, alii ema titanu, alii ura scorpio, Pythagoras parmoron, Aegyptii nisene, Itali vertumnum, alii mulcetram, alii intibum silvaticum. Nascitur ubique locis cultis et mundis et in pratis. Huius herbae divinae ad solis cursum flosceli si vertunt, et cum sol occidit, flosceli se cludeunt; rursum cum sol oritur, flosceli se aperiunt. Facit ad remedia multa."

Determining the extent of *Ex herbis*' originality depends largely on discovering whether the author employed literary sources other than Dioscorides' text. Heinrich Kästner and Charles Singer said that the author used Pliny's *Natural History* and Pseudo-Apuleius' *Herbarius.*[55] Kästner added Galen's *On Simple Medicines.*[56] Max Wellmann rejected Pseudo-Apuleius' *Herbarius*, and his judgment is vindicated by a close comparison of texts.[57] Although Pseudo-Apuleius is earlier, probably dating from the fourth century, the author of *Ex herbis* probably was unaware of the work. Certainly, he wrote about some of the same herbs discussed by Pseudo-Apuleius, but the text, iconography, plant descriptions, and uses do not resemble one another. In attempting to demonstrate Pseudo-Apuleius as a source for *Ex herbis*, Kästner used a text of Pseudo-Apuleius that differs from the critical edition prepared by Ernest Howard and Henry Sigerist.[58] Kästner's claim must be rejected in favor of Wellmann's arguments.

Galen was also not a source for *Ex herbis femininis*. Galen's *On Simple Medicines* was not known to the early Middle Ages in Latin. There exist Latin Pseudo-Galenic works on simples (drugs from a single plant), called *Ad Paternianum* and *De dynamidiis* and known during the early Middle Ages, but these tracts were not sources for *Ex herbis.*[59] Of course, since *Ex herbis*' author knew Greek and was using Dioscorides' Greek text, he could have used Galen's *On Simple Medicines* in Greek, but the new information in *Ex herbis* does not relate to Galen's account.

Although the case for Pliny as a possible source is more difficult to assess, Pliny is an unlikely candidate. The problem is compounded by the fact that both Dioscorides and Pliny drew on a common source, Sextius Niger, for some of their material on herbs.[60] In isolated instances

55. Kästner, "Pseudo-Dioscorides," p. 582; Singer, "Herbal in Antiquity," p. 47.

56. Kästner, "Pseudo-Dioscorides," p. 582.

57. Wellmann, "Dioskurides," p. 1134.

58. Cf. Kästner's text, p. 588, on the herb *buglossa* with the Howald-Sigerist ed. of Pseudo-Apuleius, p. 89, no. 41.

59. *De simplicibus medicamentis ad Paternianum* and *De dynamidiis* (and *Alter liber de dynamidiis, magna ex parte ex Aetio desumptus, plurimis in locis correctus*) as published in Galen, *Omnia, quae extant in Latinum sermonem conversa . . .*, 11 vols. (Basel, 1561) III, 18-36, 79-92.

60. Max Wellmann, "Sextius Niger. Eine Quellenuntersuchung zu Dioscorides," *Hermes, 23* (1888), 530-569; cf. W. H. S. Jones, *Pliny: Natural History,* 10 vols. (Cambridge, Mass.: Harvard University Press, 1951), vols. VI, VII. An example of similarity between Pliny and Dioscorides is seen in their treatment of wild astaphis – Dioscorides, 4.152; Pliny, *Natural History*, 23.13.17-18.

Ex herbis' added material is somewhat similar to the same medicinal uses in Pliny; but the instances are rare and one would expect some similar but coincidental uses. The fact that Pliny lists numerous medicinal uses that *Ex herbis* does not give for the same herb mitigates against the possibility that the author of *Ex herbis* used Pliny. The near certainty is that he did not.

A study of other ancient writers on materia medica and plants fails to identify the source of *Ex herbis*' new material. The author did not use Aetius of Amida, Theophrastus, Gargilius Martialis, Solinus, Oribasius, Caelius Aurelianus, Aretaeus, Pseudo-Hippocrates, Scribonius Largus, Cassius Felix, Quintus Serenus, Alexander of Tralles, Theodorus Priscianus, Marcellus, or the Pseudo-Pliny.[61]

In the absence of evidence to the contrary, I proposed that the author of *Ex herbis femininis* added new material largely from his own medical and botanical knowledge and experience. Certainly his free translations, his interspersing of new material, and his medically and botanically reasonable omissions suggest that he was sufficiently capable and knowledgeable to have composed the new material. Nonetheless,

61. Aetius of Amida, *Libri medicinales*, ed. Alexander Olivieri, Corpus Mediocorum Graecorum, 8, 1-2 (Leipzig: B. G. Teubner, 1935-1950); Theophrastus, *Enquiry into Plants*, ed. Arthur Hort, 2 vols. Cambridge, Mass.: Harvard University Press, 1948); Gargilius Martialis, *Medicinae ex oleribus et pomis*, ed. Valentin Rose, in *Plinii secundi* . . . (Leipzig, 1875); Oribasius, *Collectionum medicarum reliquiae*, ed. Johannes Raeder, Corpus Medicorum Graecorum, 6, 1, 1 (Leipzig and Berlin: B. G. Teubner, 1924); Pseudo-Oribasius, *Apla urivasii de herbarum virtutem* (*Euporistes*), in vol. VI of *Oeuvres d' Oribase*, ed. C. Bussemaker and Charles Daremberg (Paris, 1876); Pseudo-Hippocrates, *Dynamidia*, ed. Valentin Rose, in Rose, *Anecdota Graeca et Graecolatine* (Berlin, 1870; repr. Amsterdam: Hakkert, 1963); Scribonius Largus, *De compositionibus medicamentorum liber unus* . . . (Paris, 1528), and *Compositiones*, ed. G. Helmreich (Leipzig, 1887); Cassius Felix, *De medicina*, ed. Valentin Rose (Leipzig, 1879); Paulus Aegineta, *The Seven Books of* . . . , trans. Francis Adams, 3 vols. (London: Sydenhan Society, 1844-1847); Quintus Serenus, *Liber medicinalis*, ed. R. Pépin (Paris: Presses Universitaires de France, 1950); Alexander Trallianus, *Practica* (Venice, 1522), also in *Original-Text und Uebersetzung* . . . , ed. Theodor Puschmann, 2 vols. (Vienna: W. Baumüller, 1879); Marcellus, *De medicamentis liber*, in *Ueber Heilmittel*, ed. Max Niederman, 2 vols., Corpus Medicorum Graecorum, 5 (Berlin: Akademie-Verlag, 1968); Caelius Aurelianus, *On Acute Diseases and On Chronic Diseases*, ed. and trans. I. E. Drabkin (Chicago: University of Chicago Press, 1950); Celsus, *De medicina*, ed. and trans. W. G. Spencer, 3 vols. (Cambridge, Mass: Harvard University Press, 1948-1953); Theodorus Priscianus, *Euporiston Libri III*, and Pseudo-Theodorus, *De simplici medicina*, ed. Valentin Rose (Leipzig: B. G. Teubner, 1894).

there is the evidence to the contrary, because often, when he used completely new material for a whole entry, not relying on Dioscorides at all, the style changes. This fact suggests that he was copying from another literary source. This may be a lost herbal or more probably, given the style of listing ailments and then prescriptions, a *receptarius.*[62] We can speculate that the unknown source, or one of the sources, was African, and thus explain the African synonyms that may have confused Hermann Stadler. Newby's suggestion that the African synonyms may have a factual basis would support this possibility. Probably *Ex herbis*' author used an unidentified source or sources in addition to Dioscorides *and* employed his own medical-botanical judgments and information in managing his material.

Since the author relied demonstrably on Dioscorides and perhaps on other sources, can this treatise still be called original? Even if we judge by modern standards, the answer is surely yes. The modifications of information about herbs are not small or trivial contributions. Nowadays, when a researcher "discovers" a "new" curative or beneficial use of some organic or inorganic chemical, the work is hailed as a contribution to knowledge. By the same token, when the author of *Ex herbis* said, for instance, annual mercury (no. 22) relaxes the stomach when taken as an elixir with oil, that statement itself may be a claim for originality, since it was not in the works of his known authority. When a scientist or a historian writes a journal article or book, he does not reauthenticate every item of information he handles; mostly he reviews previous work before advancing the limited new data or consideration. If anyone today were to publish a medical herbal with so many changes in previously conventional factual knowledge, the work would immediately be hailed as a significant contribution. And so it should be with *Ex herbis femininis*.

Beginning with the first manuscript copy in the ninth century, abbreviated chapter headings, called *capitula*, were added to *Ex herbis*. In each chapter heading the herb was named and its medicinal uses indicated. This served as a brief guide for easy reference by a physician.[63] At some time during the twelve century or earlier, as revealed in

62. Some herbals, e.g., Felix Cassius' *De medicina*, Alexander Trallianus' *Practica*, and Scribonius Largus' *Compositiones*, do, however, use the format of listing afflictions and then giving recipes.

63. Florence, Laur. Ms. Plut. 73.41, s. XI, fols. 84-86v; London, Brit. Lib. Ms. Add. 8928, s. X, fols. 62v-65; Vatican, Ms. Barberiniano lat. 160, s. IX, fols. 38-39v.

seven manuscripts, three written in the twelfth century, some unknown author expanded the *capitula* by increasing the textual discussion of the medicinal uses of herbs, while at the same time he dropped eight herbs from the text: "centimorbia," "purpurea," "zamalentition," "zamalentition masculum," "sion," "lycanis," "abrothonum," and "aperine."[64] In rare instances the author added new medicinal uses found neither in the regular text of *Ex herbis* nor in the earlier *capitula.*[65] This work constituted a separate book and always preceded the full version of *Ex herbis*. Wherever and whenever he lived, whoever he was, the unknown author of Book I made a small attempt to make medical knowledge of plants more readily and easily accessible and added some new medical and pharmaceutical discoveries. As contributions go, however, it was small.

The Old English translation of *Ex herbis* is found in three manuscripts, of the ninth, tenth, and eleventh centuries. This translation is still another indication of the adaptiveness of the copyists/translators.[66]

64. Florence, Laur. Ms. Plut. 73. 16, s. XIII, fols. 179r-v; Florence, Strozz. Ms. lat. 73, s. XIII, fols. 39v-44v; London, Brit. Lib. Ms. Harley 1585, s. XII, fols. 79-82v (specifically calling this material a separate book); London, Brit. Lib. Ms. Royal App. 3, s. XIV, fols. 18-20v; London Brit. Lib. Ms. Sloane 1975, s. XII, fols. 49v-52v; Oxford, Bodl. Ms. Ashmole 1462, s. XIII, fols. 61-63v; Vienna, NB Ms. lat. 93, s. XIII, fols. 133-135v. See the description in John M. Riddle, "Dioscorides," *Catalogus, 4* (1980), 132-133.

65. For instance, Book I adds to the entry for the herb camelleon, or pine-thistle, that it sharpens vision ("visum exacuit"). Where *Ex herbis* says of *adiantos*, or maidenhair (no. 14), that "capillos cadentes continent," Book I has "Alopiectias vastat," or "it destroys fox-sickness." Fox-sickness, or fox mange, causes baldness. For *cameleuca*, or common teazle (no. 52), Book I adds to *Ex herbis*' advice on preparation by stating that the herb is beaten into a pliant powder and strained. The italicized words are those added to the text: Tunsa et *pulverem mollissimum redacta* et cribata et in aqua calida data."

66. London, Brit. Lib. Ms. Cotton Vitellius C III, s. XI, fols. 58/14b-74v/11b, 316; London, Brit. Lib. Ms. Harley 585, s. X, fols. 66v/11-101v/114; Ms. Harley 6258b, s. XI, fols. 110a/20a-124/29b; Oxford, Bodl. Ms. Hatton 76, s. XI, fols. 110a/20a-124/29b, published in *Rerum Britannicarum medii aevi scriptoris* (London 1864-1866), vol. I: Cockayne, *Leechdoms, Wortcunning, and Starcraft*, vol. I, and reprinted with Cockayne's Introduction with discussion of texts omitted and Charles Singer's Introduction substituted in London, 1961. The Cotton Vitellius Ms., which was the principal manuscript followed by Cockayne, has many of the leaves for the *Ex herbis* section disarranged in the binding. The correct order is 11-61, 64, 63, 74, 65-67, 62, 71, 70, 68, 73, 72, 69, 75-82. See George T. Flom, "On the Old English Herbal of Apuleius Vitellius C III," *J. Eng. Ger. Phil., 40* (1941), 29-37, esp. p. 32; and the more recent discussion of all manuscripts in de Vriend, *Old English Medicina*, p. xii, which notes the

Chapters numbered from 134 through 175 are mostly derived from *Ex herbis*, often freely translated and modified. Although this paper does not encompass an analysis of the Old English version, I note several examples of changes. To the medical uses of acanthus (no. 1), the Old English version adds that it promotes milk in the breast;[67] for shepherds' pure (no. 16), it changes *Ex herbis*' apparent claim of an abortative quality to that of a provoker of menstruation.[68] New herbs are added.[69] In one case, even where the same herb is in *Ex herbis*, the Old English version has an entirely different text.[70] Plants habitats are modified.[71] In a few cases the author of the Old English version probably had in mind plants different from those in *Ex herbis*, probably because he was treating a few herbs prevalent in the British Isles but not well-known in southern Europe, where most of *Ex herbis*' plants came from.

The influence *Ex herbis* diminished in the high and late Middle Ages. The enlarged Alphabetical Dioscorides Latin Recension, providing some competition, was produced by the late eleventh or early twelfth century.[72] More competitive yet were the *Circa instans* of Matthews Platearius and the *Herbal* of Macer. *Ex herbis* was still used, but mainly as a resource authority for new herbals. Copyists occasionally lifted entire chapters together with the illustrations for their herbals when *Ex herbis* had information that fit some particular need. Simon of Genoa (flourished in the late thirteenth century), referred to *Ex herbis* as "librum antiquum istoriatum."[73] By the late Middle Ages *Ex herbis*

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disarrangement. The most recent study of Cotton Vitellius C III is admirably done by Linda E. Voigts, "A New Look at a Manuscript Containing the Old English Translation of the *Herbarium Apulei*," *Manuscripta, 20* (1976), 40-60, where Voigts accepts Ker's eleventh-century dating and adds new evidence; see also Voigts' new study, "One Anglo-Saxon View of the Classical Gods," *Stud. Icon., 3* (1977), 3-16. I am indebted to Dr. Voigts for her assistance in helping me with the Old English Texts.

67. No. 161, I, 288-290, Cockayne ed.

68. No. 150, I, 276-6, Cockayne ed.

69. E.g., nos. 140, 146, and 151.

70. Cf. no. 35 in *Ex herbis* with Old English no. 137, I, 254-257, Cockayne ed.

71. Cf. no. 11 in *Ex herbis* with Old English no. 139, I, 257-258, Cockayne ed.

72. John M. Riddle, "The Latin Alphabetical Dioscorides," *Proc. 13th Int. Cong. Hist. Sci.* (Moscow, 1974), secs. 3, 4, pp. 204-209.

73. Montpellier, École de médicine Ms. H 127, s. XV, fols. 101v-111: "Incipit liber Apuliensis Platonis De herbis femininis quem Simon Januensis vocat Librum Antiquum Istoriatum." The text is Pseudo-Dioscorides' *Ex herbis*. The rubric and colophon in the Montpellier Ms. are the same.

femininis was virtually forgotten, but its influence surpassed its memory. It is a good example of early medieval medical literature in which an unknown author, appropriating the name of a classical authority, sought to record in pictures and words the herbs of the field and their uses for man. The effort was important, influential, and meritorious. Flaws there are, but fewer than previously noted. There is no reason to relegate this work to the margins of history as an example of poor botany and poor medicine in a poor age that cared about neither field. The author of *Ex herbis femininis* wrote a praiseworthy herbal.

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Key

André	Jacques André, *Lexique des termes de botaniques en latin* (Paris: C. Klincksieck, 1956)
Bierbaumer	Peter Bierbaumer, *Der botanische Wortschatz des Altenglischen*, Part 2, *Lacnunga, Herbarium Apuleii, Peri Didaxeon* (Frankfurt: Peter Lang, 1976)
Carnoy	Albert Carnoy, *Dictionnaire, étymologique des noms grecs de plantes* (Louvain: Publications Unviersitaries, 1959)
Cockayne	Thomas Oswald Cockayne, *Leechdoms, Wortcunning, and Starcraft of Early England*, 3 vols. (London 1864-1866; repr. London: Holland Press, 1961)
Daubeny	Charles Daubeny, *Lectures on Roman Husbandry* (Oxford, 1857)
D.	Dioscorides, *De materia medica libri quinque*, ed. Max Wellmann, 3 vols. (Berlin: Weidmann, 1958)
Font y Quer	P. Font y Quer, *Plantas medicinales el Dioscórides renovado* (Barcelona: Editorial Labor, 1962)
Grieves	Maud Grieves, *A Modern Herbal* (New York: Dover, 1971)
Gunther	Robert T. Gunther, *The Greek Herbal of Dioscorides* (New York: Hafner, 1959)
Hort	Arthur Hort, *Theophrastus: Enquiry into Plants*, 2 vols. (Cambridge Mass.: Harvard University Press, 1949)
Jones	W. H. S. Jones, *Pliny: Natural History*, in 10 vols., vols. 6-7 (Cambridge, Mass.: Harvard University Press, 1951, 1956)
Kraemer	Henry Kraemer, *A Textbook of Botany and Pharmacognosy*, 4th ed. (Phildadelphia: Lippincott, 1910)
Leek	Sybil Leek, *Herbs, Medicine, and Mysticism* (Chicago: H. Regnery, 1975)
Polunin	Oleg Polunin, *Flowers of Europe* (London: Oxford University Press, 1969)
Pseudo-Apuleius	*Herbarius*, in *Antonii Musae* . . . *Pseudo-Apulei* . . . , ed. Ernest Howald and H. E. Sigerist, Corpus Medicorum Latinorum, vol. IV (Leipzig: B. G. Teubner, 1927)
Pushmann	Theodor Puschmann, *Alexander von Trallus*, 2 vols. (Vienna: W. Braumüller, 1879)
Schneider	Wolfgang Schneider, *Lexikon zur Arzneimittelgeschichte*, 7 vols., vol. V in 3 parts., *Pflanzliche Drogen* (Frankfurt: Govi-Verlag, 1974)

Ex herbis	Dioscorides	Probable scientific name	Common name	Old English (nos. to Cockayne ed.)
1. Acantha leuca; hecynum	3.12: ἄκανθα λευκή (citations to Wellmann ed.)	*Crataegus oxyacantha* L., *Crataegus monogyna* Jacq.	Hawthorn, whitethorn, etc. (Grieves, p. 385; Polunin, no. 461)	Beowyrt, or becwort no. 154 (Bierbaumer, 2, p. 11)
	Bierbaumer believes the Old English text comes from Dios., 3.19, which concerns *Acanthus mollis* L., or bear's breech. The Old English text, however, has some material, e.g., a use for lung disease, not found in either *Ex herbis* or Dioscorides.			
2. Buglossos	4.127: βούγλωσσον	*Borago officinalis* L. (Font y Quer, no. 389); *Lingua bubula* (André, p. 188)	Burrage (Grieves, pp. 119-20)	
3. Acantus	3.17: ἄκανθος	*Acanthus mollis* L. (Font y Quer, no. 99a, or, possibly, *Acanthus spinosus* L. (Schneider, V, 1, 34-35)	Bear's breech (*A. Mollis*) or spiny bear's breech (*A. Mollis*) (Polunin, nos. 1266-1267)	
4. Helylosfacos; Salvia	3.33: ἐλελίσφακον	*Salvia officinalis* L. (Font y Quer, no. 474); *Salvia triloba* (Poulnin, no. 1143)	Common sage (Grieves, pp. 700-705)	
5. Cyminum	3.60: κύμινον ἄγριον	*Cuminum cyminum* L. (Font y Quer, no. 342; Schneider, V, 1, 398-399) *Cuminum agreste* (André, p. 180)	Cumin (Grieves, pp. 242-243)	Cymen, no. 155 (Bierbaumer, pp. 3, 31)
6. Camelleon	3.8: χαμαιλέων λευκός	*Atractylis gummifera* (Font y Quer, no. 599; cf. Carnoy, p. 75); *Chamaeleon albus* (André, p. 84)	Pine-thistle (Polunin, no. 1471)	
	Hort (II, 483) identifies camelleon as *Atractylis gummifera*. Cockayne (I, 283) says that in the Old English version what is probably described is wolfs' teazle – *Carlina acaulis* or *Acarna gummifera*. Jones (Pliny, 22.21.45) agrees with Hort's identification in translating Pliny. The description in *Ex herbis* might also fit European ground pine or yellow bugle (*Ajuga chamaepitys*, Schreb.) – see Grieves, p. 141. *Ex herbis* modifies Dioscorides' plant description.			
7. Erpullos	3.38: ἕρπυλλος	*Thymus serpyllum* L. (Font y Quer, no. 493; Schneider, V, 3, 340; Carnoy, pp. 143-144)	Wild thyme (Grieves, pp. 813-815; Polunin, no. 1164)	

Ex herbis	Dioscorides	Probable scientific name	Common name	Old English (nos. to Cockayne ed.)
8. Camedrios	3.98: *χαμαίρωψ*	*Teucrium chamaedrys* L. (Font y Quer, no. 445; André, pp. 85, 322); *Buisson epineux* (Carnoy, p. 76)	Wall germander (Grieves, p. 760)	
	It is possibly *Veronica chamaedrys* L. or speedwell, germander; Polunin, no. 1228.			
9. Polygonos	4.4: *πολύγονον ἄρρεν*	*Polygonum aviculare* L. (Font y Quer, no. 71; Carnoy, p. 221; André, p. 257)	Knotgrass (Grieves, pp. 457-458; Polunin, no. 80)	
	Dioscorides has two chapters: 4.4, *πολύγονον ἄρρεη*, which he says is male, and 4.5, *πολύλονον θῆλυ*, which is female. *Ex herbis* uses the description of the male plant, although D. says that both plants have about the same medicinal virtues. D. says the plant has many seeds, and therefore it is called male. *Ex herbis* omits the statements of D. that the plant is male but does note that it has many seeds. Pliny (27.41.113-117: *sanguinaria*) says there are four kinds, two being male and female.			
10. Samsucon	3.39: *σάμψουχον*	*Origanum majorana* L. (Font y Quer, no. 491; Carnoy, p. 234; Schneider, V, 2, 283-284)	Sweet marjoram (Grieves, pp. 519-521)	
	There is also marjoram (*Origanum vulgare* L.), which may be the plant described, but both species have the same medicinal action.			
11. Cestros, sive Stergestros vel Sempervivum (in various mss)	4.88: *ἀειζῳον μέλα*	*Sempervivum tectorum* L. (Font y Quer, no. 183; Carnoy, p. 11; André, p. 289)	Houseleek (Grieves, pp. 422-423; Polunin, no. 383)	Aizos (?), no. 139
	D. has "larger Aeizōon" (4.88) and "smaller Aeizōon" (4.89), and Sprengler believes the larger one is *Sempervivum arboreum* and the smaller *S. tectorum*. Houseleek is suggested in the *Ex herbis* description. See also no. 33 below. *Cestros*, presumably from *κέστρον* (D., 4.1), means betony (Pliny, 26.46.84), but the author of *Ex herbis* took the text and description from D.'s entry *ἀειζωον μέγα*, which refers to houseleek. The Old English text refers to *Aizus minor* (see *Ex herbis*, no. 33) and seems to distinguish it from aizos without further description.			
12. Aristolochia	3.4: *ἀριστολοχεία*			
	D. says there are three kinds: female (round leaves, sweet-smelling, etc.), male (round leaves but longer ones, purple flowers, etc.), and *Aristolochis clematitis*. *Ex herbis* says there are two kinds, male and female, thereby omitting *A. clematitis*. Pliny (25.54.97-98) names four kinds: male, female, clematis, and pistolochia. Font y Quer (pp. 193-197) says that there are around 400 species of plants in the genus of *Aristolochia*. For D., he distinguishes: 101: *Aristolochia rotunda* L; 102: *A. longa* L; 104: *A. pistolochia* L; 105: *A. baetica*. What *Ex herbis* describes is uncertain because the description is even sketchier than D.'s text, but it would appear to be Font y Quer's no. 101 as the female and no. 102 as the male. The drawing in Vienna Ms. 93 appears closest to *A. longa*, or the male variety; cf. Carnoy, p. 37, and André, pp. 40-41.			
13. Sticas	3.26: *στοιχάς*	*Lavandula stoechas* L. (Font y Quer, no. 454; André, p. 304; Carnoy, p. 354)	French lavender (Grieves, pp. 468-473; Polunin, no. 1110)	Stecas, no. 149
14. Adiantos; polytichos; callistrichos	4.134: *ἀδίαντον*	*Adiantum capillus-Veneris* L. (Font y Quer, no. 34; André, p. 18; Carnoy, p.9)	Maidenhair, or maiden spleenwort (Kraemer, pp. 61ff; Leek, p. 219)	
15. Mandragora	4.75: *μανδραγόρας*	(?) *Mandragora officinarum* L.	Mandrake	
	D. says there is a female and a male variety but also a third kind called *morion*. The text appears to give the medicinal virtues of the male variety. *Ex herbis* gives the male and female varieties and says both have the same medicinal action. Font y Quer (pp. 590-595) and André (p. 199) say that the male and female varieties described in D. may be *M. officinarum* and *M. vernalis* or *M. autumnalis*. Grieves (pp. 510-512) reports that the mandrake contains two mydriatic alkaloids and is therefore akin to belladonna and identical with			

Ex herbis	Dioscorides	Probable scientific name	Common name	Old English (nos. to Cockayne ed.)
	atropine, or hyoscyamine. Polunin (no. 1185) reports *M. officinarum* as having a European habit. There may be some confusion between *M. officinarum* and *M. autumnalis*.			
16. Thlaspis; mia	2.156: θλάσπι	*Thapsia garganica* L. (Font y Quer, no. 362) *Capsella bursa pastoria*	Shepherd's purse (Grieves, pp. 738-739; Polunin, no. 340)	Lombes cyrse, no. 150 (Bierbaumer, p. 75)
	André (p. 315) and Carnoy (p. 264) identify D.'s *thlaspis* with *Capsella bursa pastoris*. *Ex herbis* gives *mia*, as a synonym, and André (p. 208) believes *mia* in *The Old Latin Dioscorides* (2.156) is probably μυῖτις. Bierbaumer (p. 75) identifies the Old English "Lombes cyrse" as (1) *Cardamine hirsuta* L.? (2) *Capsella bursa-pastoris* L., or shepherd purse, or (3) *Thlaspi arvense* L., or field pennycress.			
17. Sisimbrium	2.128: σισύμβριον	*Sisymbrium sophia* L. (Font y Quer, no. 166) *Nasturtium offinale* R. Br. (Carnoy, p. 296) *Mentha sativa* (André, p. 296; Carnoy, p. 246)	Flixweed (Polunin, no. 288) Watercress (Polunin, no. 307) Wild mint	
	The picture in Vienna Ms. 93 suggests that what *Ex herbis* is describing is *Mentha sativa*, or wild mint. Flixweed is in the mustard family, but according to Grieves (p. 570) has almost the same medicinal action as wild mint. Carnoy (p. 246) believes that *sisimbrium* applies to a variety of aquatic plants, specifically *Mentha aquatica* and/or *Nasturtium officinale*.			
18. Celedonie	2.180: χελιδόνιον μέγα	*Chelidonium majus* L. (Font y Quer, no. 135, cf. André, p. 86, who has a broader list of possibilities, but the pictures in *Ex herbis* seem to go with greater celandine)	Greater celandine, or common celandine (Grieves, pp. 178-179; Polunin, no. 274)	
19. Camemelos	3.137: ἀνθεμίς	*Anthemis arvensis* (?) (Font y Quer, no. 575, cf. André, p. 84; Carnoy, p. 75)	Mayweed (Grieves, p. 523); corn chamomile (Polunin, no. 1411)	
	D. says that there are three kinds. The description of the first approximates *A. arvensis*, and the other two are probably *A. tinctoria* and *A. cotula*, all varieties of mayweed. The *Ex herbis* description is taken from D.'s first type. André and Carnoy say the D. entry could refer to a variety of plants.			
20. Sideritis	4.33: σιδηρίτις	*Sideritis hirsuta* L. (?) (Font y Quer, nos. 458, 460)	Heracules panaces (?) Polunin, no. 1115; cf. no. 1114)	
	Daubeny (p. 313) believes D.'s entry to be *Sideritis romana*; Gunther (p. 428) has *Sideritis remota*. The illustration in Vienna Ms. 93 is closest to *Sideritis hirsuta*. André (p. 292) identifies D.'s entry with millefolium and Carnoy (p. 243) says the entry particularly applies to *Sideritis romana*.			
21. Flommos	4.103: θλόμος	*Verbascum thapsus* L., but possibly *V. sinuatum* (Font y Quer, no. 416; cf. André, pp. 326-327)	Great mullein / golden / rod / foxglove / Aaron's rod, etc. (Grieves, p. 562; Polunin, no. 1193)	
	There are about 210 species, and certainty is therefore difficult.			
22. Lynozostis; lingostes	4.189: λινόζωστις	*Mercurialis annua* L. (Font y Quer, no. 95) *Mercurialis perennis* L. (André, p. 188)	Annual mercury (Grieves p. 530; Polunin, no. 667) Dogs mercury (Polunin, no. 666)	
	Both D. and *Ex herbis* speak of a male and a female variety.			
23. Antirenon	4.130: ἀντίρρινον	*Antirrhinum majus* L. (Font y Quer, no. 419); *Antirrhinum orontium* L. (André, p. 33)	Snapdragon (Grieves, p. 746; Polunin, no. 1197); Weasel's snout (Polunin, no. 1199)	

Ex herbis	Dioscorides	Probable scientific name	Common name	Old English (nos. to Cockayne ed.)
24. Britannica	4.2: βρεττανική	Veronica chamaedrys (?)	Germander speedwell (?) (Polunin, no. 1228)	
	The *Notha*, a later addendum to some Greek D.'s Mss, say that the British plant is the same as vettonica (*ρυμαῖοι βεττονίκαμ*), which Paul of Aegina (7.3) has as Paul's betony and which is listed by Grieves (p. 759) as *Veronica chamaedrys*, or Germander speedwell. Font y Quer has no identification. *Ex herbis* has: "Brittanica sive damasonion." Pliny (25.77.124) says *damasonion* is the same as *lyron*, which is today called purple loosetrife (*Lythrum salicaria* – Grieves, p. 496). The description given by D. seems closest to *Veronica chamaedrys*. André (p. 58) suggests it might be a kind of *rumex*, whereas Carnoy (pp. 49– 50) associates it with betony. The picture in *Ex herbis* corresponds to Germander's speedwell.			
25. Psillios	4.69: ψύλλιον	*Plantago psyllium* L. (Font y Quer, no. 507; André, p. 263)	Psyllium plantain (Grieves, pp. 643-644)	No. 169
26. Melena	4.183: ἄμπελος μέλαινα	*Tamus communis* L. (Font y Quer, no. 653); *Tamus viridis* (Carnoy, p. 23)	Poison black bryony / blackeye root (Grieves, pp. 130-131; Polunin, no. 1674)	
27. Tribulenta	4.15: τρίβολος	*Tribulus terrestris* L. (Font y Quer, no. 300)	Land caltrop / Small caltrops / Maltese cross (Polunin, no. 655)	Gorst, no. 142 (Bierbaumer, p. 54)
	D. and Pliny (22.13.17) say that there are two kinds – one that grows on land and another in water, probably water caltrop (*Traba natans*). *Ex herbis* says that there are two kinds: "one which is found in gardens, the other is wild." *Ex herbis*' description seems to be only of land caltrop; why the author says that there are to kinds is unclear. The Old English version says *tribulus* is gorst.			
28. Coniza	3.121: κόνυζα	*Inula conyza DC* (Font y Quer, no. 559); *Inula vis cosa* for male and *graveolen* for female variety (André, p. 100)	Ploughman's spikenard / great fleabane / and little fleabane (Grieves, pp. 760-761; Polunin, no. 1387)	Conize,
	D. describes three kinds, two of which Gunther (p. 366) lists as *Inula viscosa* and *I. saxatilits*. *Ex herbis* describes two kinds, which are probably great fleabane and little fleabane.			
29. Strygnos	4.70: στρύχνον κηπαῖον	*Solanum nigrum* L. (Font y Quer, no. 407; André, p. 305; Carnoy, p. 255)	Black nightshade (Grieves, pp. 582-583; Polunin, no. 1182)	Foxglove (?), no. 144 (Bierbaumer, p. 49)
	A synonym given by *Ex herbis* is *manicos*. D. has an entry (4.73) that the Old English version took to mean foxglove. The entry of *στρύχνον μανικόν* in *Ex herbis* is clearly from D., 4.70, while the Old English seems to be giving the medicinal uses for foxglove, *Digitalis purpurea*.			
30. Bustalmon	3.139: βούφθαλμον	*Anthemis tinctoria* L. (Schneider, V, 1, 102); *Anthemis valentina* (?) = *Chrysanthemum coronarium* L. (André, p. 61)	Yellow chamomile (Polunin, no. 1409); Mayweed (?)	Buoptalmon, no. 141
	Pliny (25.102.160) says *buphthalmos* is a kind of *aizoöm*, or houseleek. *Buphthalmos* means "bull's eye." There is a plant today called bull's eye, but it is marsh marigold (*Clatha paulstris*). The description in *Ex herbis* does not fit (see Grieves, p. 519). Probably, *buphtholomos* is a variety of *anthemis*, or mayweed, but Dioscorides, *Ex herbis*, and the Old English Text are unclear as to the plant described.			

Ex herbis	Dioscorides	Probable scientific name	Common name	Old English (nos. to Cockayne ed.)
31. Isfieritis				Spreritis, no. 138
	Identification is uncertain, this being the only plant in *Ex herbis* for which a corresponding chapter in D. cannot be found. The Old English version's entry (Cockayne, I, 256-257) identifies it as D.'s *ἀναγαλλίς* (2.178). The Old English word is *spreritis*, of which Cockayne said: "Σ *πυρίτις* is a medieval synonym of the *ἀνάγαλλις ἡ φοινική*, the scarlet pimpernel," on the basis of marginal notes to D., 2.209. The text is *Ex herbis* does not relate to the D. entry. There are two drawings of *anagallis* found in the Greek Dioscorides, Vienna Ms. Gr. 1, fols. 39-40, but despite some similarities there is a different leaf arrangement on the stems, when one compares the drawings in *Ex herbis* to those in Vienna, Ms. 93, and Florence, Laur. Ms. Plut. 41.73. Further, I could find no such synonym as that referred to by Cockayne in Vienna, Ms. Gr. 1, fol. 40. André (p. 299; cf. p. 66) lists *spieritis* in *Ex herbis* (no. 31) as possibly "caltha" (*Calendula arvensis L.*), or marigold, but the illustrations in the *Ex herbis'* manuscripts do not resemble marigold. André cross-lists *spieritis* with caltha and cites the entry on *λευκόιόν* in George Goetz, *Corpus Glossariorum Latinorum*, 7 vols. (Leipzig, 1888-1923), index, VI, 170, but Goetz does not identify *spieritis* with caltha (*caltha*, however = *λευκόιόν*). Bierbaumer does not identify the Old English herb *spreritis*. The picture in *Ex herbis* has two different structures of flowers, which makes identification even more difficult.			
32. Hyppypres	4.47: *ἑτέρα ἵππουρις*	*Equisetum telmateia* (Font y Quer, no. 23; André, p. 163; Carnoy, p. 146)	Horsetails	
	Gunther (p. 438) believes that D.'s horsetails may be either *Equisetum sylvaticum* or *E. fluviatile*. Grieves (pp. 419-421) reports four species of horsetails common in Europe.			
33. Aizos	4.89: *ἀειζων το μικρόν* and	*Sempervivum tectorum* L. (Font y Quer, no. 183; cf. André, p. 289; Carnoy, p. 11)	Houseleek (Polunin, no. 383)	Aizos minor, no. 139
	4.88: *ἀεζων τὸ μέγα*			
	See no. 11 above. Gunther (p. 487), lists *Sempervivum ochroleucum*; Cockayne (I, 257) gives *S. sediforme*, for Old English descriptions. *Ex herbis* modified D.'s description and combines two chapters in D. (89 and 88), "major" and "minor" houseleeks, but D. says the medicinal virtues of both are the same.			
34. Tytimallos	4.164: *τιθυμάλλου*	*Daphne gnidium* L.	Mediterranean mezereon (Polunin, no. 758)	
	εἴδη ἑπτά	or *Euphorbia characias* (Font y Quer, pp. 388-389; cf. André, pp. 317-318; Carnoy, p. 268)	Large Mediterranean spurge (Polunin, no. 678)	
35. Eliotropios	[4.190: *ἡλιοτρόπιον τὸ μέγα*]	*Taraxcum offinale*	Weber dandelion	[Sigilhweorfa, no. 137 – text not related to *Ex herbis*] (Bierbaumer, p. 104)
	[4.191: *ἡλιοτρόπιον τὸ μικόν*]	*Cichorium intybus* L.	Chicory (Polunin, no. 1512)	
	Ex herbis has two entries, no. 35 and 50, but neither correspond to D.'s chapters. Moreover, the pictures of the two plants in *Ex herbis* are different. And the drawings of plant 35 in *Ex herbis* show an impossible arrangement of leaves. The drawings show large, broad, serrated leaves coming from a fleshy rhizome, while from the nodes come stems from which branch narrow, long, smooth-edged leaves in alternate arrangement and small flowers on stems, some of which branch from leaf nodes while others come from stems without foliation. Font y Quer (nos. 335 and 921) identifies the two entries in D. as *Heliotropium europaeum* (heliotrope, no. 1045 in Polunin) and *Chrozophora tinctoria* (turnsole, no. 665 in Polunin), but these appear impossible in *Ex herbis*. The Old English entry *sigilhweorfa*, with synonym *heliotropus*, does not relate textually to either *Ex herbis* or D. Bierbaumer (p. 104) lists for *sigilhweorfa* five possibilities: *Calendula officinalis* L.; *Cichorium intybus* L.; *Taraxacum officinale* L.; *Hypochoeris glaba* L.; or, least likely, *Heliotropium*			

Ex herbis	Dioscorides	Probable scientific name	Common name	Old English (nos. to Cockayne ed.)
	europaeum L. Of these, the picture in *Ex herbis* is closest to *Taraxacum officinale*, or dandelion, with the exception of the troublesome smooth long leaves on some stems. The medicinal usages listed also make this identification more likely. The *Ex herbis* text has: "ideo alii helioscopion vocant, Romani intybut sylvaticum." *Cichorium intybus* is chicory. Dandelion is sometimes substituted for chicory in coffee. It would appear that *Ex herbis* refers here to dandelion and possibly also to chicory.			
36. Scolymbos	3.14: *σκόλυμος*	*Scolymus hispanicus* L. (Font y Quer, no. 615; André, pp. 285-286; Carnoy, p. 238); or, *S. maculatus* (André, pp. 285-286)	Golden thistle / Spanish oyster plant (Polunin, no. 1510)	Scolimbos, no. 157
37. Achilleia	4.36: Ἀχίλλειος	*Cynara cardunculus* L.	Cardoon (Polunin, no. 1491)	Achillea, no. 175
	The *Notha* (D. 4, 36 RV) gives a synonym as *μιλλεφόλλιουμ*, or *millefolium*, and the drawing in Vienna, Ms. Gr. 1, suggests *Achillea millefolium* L. (Font y Quer, no. 577), which is also D.'s 4.114: *μύριοφυλλον* (see Carnoy, p. 5). The drawing in *Ex herbis*, esp. in Vienna Ms. 93, suggests artichoke. *Ex herbis* may be describing *Scolymus cardunculus*, or Cardoon artichoke. The drawing in *Ex herbis* is close to Pseudo-Apuleius' no. 89, *Millefolium*. Grieves (p. 863) and Polunin (no. 1417) identify *Achillea millefolium*, or yarrow or milfoil. The Old English version has *Achillea*, which Cockayne suggests may be *Archillea magna*, *A. tanacetifolia*, *A. abtotanifolie*, or *A. tomentosa*. André (p. 15) identifies *Ex herbis' Achilleia* with *millefolium*. Polunin (no. 1491) distinguishes *Cynara cardunculus*, or cardoon, from *C. scolymus*, or globe artichoke, by the fact that globe artichoke is unknown in the wild.			
38. Stafis agria	4.152: *σταφὶς ἀγρία*	*Delphinium staphisagria* L. (Font y Quer, no. 117; André, p. 303; Carnoy, p. 252)	Stavesacre / lousewort (Leek, p. 220; Polunin, no. 212)	Stavis agria, no. 171
39. Cameleia; turbiscon	4.171: *χαμελαία*	*Daphne oleoides* (Gunther, p. 572) *Daphne gnidium* L. (André, p. 315)	Ground olive (Polunin, no. 757) Mediterranean mezereon (Polunin, no. 758)	
	Although the picture in *Ex herbis* bears little resemblance to the *Daphne* family, the text says the plant has a fruit like an olive. This probably is the ground olive.			
40. Ficios; hecios; alcidiabios	4.27: *ἔχιον*	*Echium vulgare* L. (Font y Quer, no. 398; cf. André, p. 123; Carnoy, p. 115)	Viper's bugloss (Polunin, no. 1082)	Acius, no. 161
	Cockayne (I, 288-291) gives the Old English version plant as *Echium rubrum*.			
41. Splenios	3.134: *ἄσπληνος*	*Ceterach officinarum* Candolle (Font y Quer, no. 32; André, p. 45; Carnoy, p. 41) *Asplenium ceterach* L. (Grieves, pp. 302-303)	Spleewort, common	
	Ceterach is not in Polunin, but is listed in H. Gilbert Carter, *Glossary of The British Flora* (Cambridge, 1950), p. 18.			
42. Titmallos	4.164: *τιθύμαλλον*	See no. 34.		
43. Glisirisa	3.5: *γλυκύρριζα*	*Glycyrrhiza glabra* L. (Font y Quer, no. 251; Carnoy, p. 132)	Licorice (Grieves, pp. 487-492; Polunin, no. 536)	Glycyridam, no. 145
44. Bulbus rufus	2.170: *βολβὸς ἐδώδιμος*	*Hyacinthus comosus*, Sibthrop or *Muscari comosum* L. (Gunther, p. 211; Cockayne I, 321; André, p. 60)	Red bulbs or Tassel hyacinth (Polunin, no. 1645)	Bulbus, no. 184
45. Dracontea	2.166: *δρακόντιον*	*Arisarum vulgare* L. (Font y Quer, no. 677), or	Friar's cowl (Polunin, no. 1821)	

Ex herbis	Dioscorides	Probable scientific name	Common name	Old English (nos. to Cockayne ed.)
		Arum dracunculus L. (Font y Quer, no. 677; André, p. 120)	Arum arrowroot	
46. Moecon	4.64: μήκων	*Papaver somniferum* L. *Papaver rhoeas* L. (Font y Quer, nos. 132, 133: Carnoy, p. 172; cf. André, p. 202)	White poppy Red poppy or corn poppy (Grieves, p. 651; Polunin, nos. 264, 265)	
47. Colocinthios agria	4.176: κολόκυνθα ἀγρία	*Citrullus colocynthis* Schrader, or	Bitter apple (Grieves, pp. 45-50; Polunin, no. 812)	
		Cucurbitam silvestrem, or *C. caprariam*, or *C. agrestis* (Font y Quer, no. 547; André, p. 97)	Colocynth Pulp Bitter cucumber (Grieves, pp. 49-50)	
48. Ypericon; corion	3.154: ὑπερικόν	*Hypericum perforatum* L.; *H. coris, H. crispum*; or *H. barbatum* (Font y Quer, pp. 292-294; Cockayne, I, p. 277; Gunther, p. 394) *H. Crispum* André, p. 166)	Common St. John's wort (Grieves, p. 707; Polunin, no. 768)	Hypericon, no. 152 (Bierbaumer, p. 143)
49. Lapatium	2.114: λαπάθον	*Rumex patienta* (Gunther, p. 151)	Sorrel	
	Font y Quer (no. 601) identifies D.'s entry as *Arctium lappa*, but the description fits sorrel more closely. *Ex herbis* and D. said there are four kinds: possibly, *Rumex patienta, Oxyria reniformis* (mountian sorrel), *Rumex acetosa* (common sorrel) and *Oxalis acetosella* (wood sorrel). See André, pp. 178-179; Carnoy, p. 157. It is difficult to judge the species, if any, that *Ex herbis* intended. The drawing is closest to *Rumex sanquineus*, which is widespread in Europe. See Polunin, no. 98.			
50. Heliotropium	See no. 35, above.			
51. Arnoglossa	2.126: ἀρνόγλωσσον	*Plantago major* L. or *P. lagopus* (Font y Quer, no. 511; cf. André, p. 41, who identifies it only as plantain). *Alisma plantago-aquatica* L.	Common plantain, or snakeweed; or water plantain (Grieves, pp. 640-642)	
	D. says that there are two kinds, one larger and the other smaller. Gunther (p. 165) identifies the smaller as *Plantago lagopus*, while Font y Quer identifies the larger as *P. major*. *Ex herbis* discusses only one kind, and says it grows in wet places, a comment not recorded in D. This is more descriptive of water plantain (*Alisma plantago*); see Grieves, p. 645, and Polunin, nos. 1294, 1291, and 1560.			
52. Cameleuca	3.8: χαμαιλέων λευκός	*Dipsacus fullonum* L., *D. laciniatus* L., *D. silvestris*, *Atractylis gummifera* (Font y Quer, pp. 836-837; Jones, VI, 323; Gunther, p. 243; André, p. 84, gives *A. gummifera*)	Common teasle or (Polunin, nos. 1318-1319), or Pine thistle (?)	Wolfes camb, no. 156 (Bierbaumer, p. 135)
	Ex herbis' cameleuca may not be the same plant as D. was describing. The picture in Vienna, Ms. 93, does not appear to be *Atractylis gummifera*, and it resembles teasle, but *Ex herbis* gives no plant description. The Old English version gives a description and a picture that do not correspond to D.'s. Cockayne (I, 283) says the Old English version is probably describing wolf's teasle or common teasle. André identifies *Ex herbis*' entry as chamaecissos = *glechoma hederacea*; see Carnoy, p. 74.			
53. Scylla	2.171: σκίλλα	*Scilla maritima* L. (André, p. 284)	Sea squill (Grieves, pp. 766-769; Polunin, no. 1630)	

Ex herbis	Dioscorides	Probable scientific name	Common name	Old English (nos. to Cockayne ed.)
		Urginea maritima Baker; (Font y Quer, no. 639)		
54. Erigion	3.21: *ἠρύγγη*	*Eryngium campestre* L. or *E. maritimum* L. (Font y Quer, nos. 334-335) André, p. 129; Carnoy, p. 123)	Sea holly (Grieves, pp. 407-409)	Eryngius, no. 173 (Bierbaumer, p. 142)
55. Iera	4.60: *ἱερὰ βοτάνη*	*Verbena officinalis* L. (Font y Quer, no. 438; cf. André, p. 162)	Vervain (Grieves, pp. 431-433; Polunin, no. 1084)	
	4.60RV: *περιστέρεων ὕπιος*			
56. Strutios	2.163: *στρούθιον*	*Saponaria officinalis* L. (Font y Quer, no. 90; cf. André, p. 305; Carnoy, p. 254)	Soapwort (Grieves, p. 748; Polunin, no. 181)	
57. Delfion	[3.73: *δελφίνιον*; *Ex herbis* text unrelated]	*Delphinium consolida*	Field larkspur (Grieves, p. 464)	Delfinion, no. 160 (Bierbaumer, p. 142)
	Gunther (p. 316) says D.'s entry is *Delphinium peregrinum* L. and *D. consolida*, but the picture in *Ex herbis* indicates *D. consolida*. The drawing in Vienna, Ms. Gr. 1, does not resemble the drawings in various *Ex herbis* mss. André identifies *Ex herbis*' entry as *Bucinus, B. minor* (p. 117) and Cockayne (p. 289) gives *Delphinium consolida*.			
58. Centimorbia	[4.3: *λυσιμάχειο*; *Ex herbis* unrelated]	*Lysimachia vulgaris* L.	Yellow loosestrife (Polunin, no. 963)	Centimorbia (Bierbaumer, p. 141), no. 162
		L. nummerleria	Moneywort, or creeping Jenny (Polunin, no. 96)	
	Ex herbis' text and picture (cf. Vienna, Ms. Gr. 1) and various *Ex herbis* mss. do not resemble D.'s. Font y Quer (no. 368) and Gunther (p. 400) say D.'s entry is *Lysimachia vulgaris*. The drawings are closest to *L. nummuleria* (see Cockayne, I, 291), but the description of the habitat does not fit. *Ex herbis* says *Centimorbia* is "found in cultivated places and rocky places, that is, in mountains and fields." According to Grieves (pp. 549-550, 497-498) *L. nummuleria*, or moneywort, grows in damp places and *L. vulgaris*, or yellow loosestrife, beside streams. André (p. 80) identifies *Ex herbis*' entry as *L. nummuleria*. The plant is in *Ex herbis*, and its name may be new and introduced by *Ex herbis*.			
59. Viola; viola aurosa	3.123: *λευκόιον γνώριμον*	*Cheiranthus cheiri* L. (Font y Quer, no. 150)	Wall flower (Polunin, no. 299)	Bānwyrt, nos. 165 and 166 (Bierbaumer, p. 8)
		Viola lutea (André, pp. 330-331)	Mountain pansy (Polunin, no. 785)	
	The picture in *Ex herbis* seems to be *Cheiranthus cheiri*, but the text says there are three kinds, with purple, white, and honey-colored flowers, and the best kind for medicine is the yellow, which is wall flower. Perhaps another kind is *Viola odorata*, but it is also *Ex herbis*' no. 65. Bierbaumer identifies four plants described in the Old English Text: (1) *Bellis perennis* L., (2) *Centaurium umbellatum* Gilibert, (3) *Symphytum officinale* L., (4) a *viola*.			
60. Capparra	[2.173: *κάππαρις*; *Ex herbis* unrelated]	*Capparis spinosa* L. (Font y Quer, no. 137, André, p. 70)	Caper (Polunin, no 283)	Wudubend, no. 172 (Bierbaumer, p. 130)
		Lonicera periclymenum L.	Honeysuckle (Polunin, no. 1304)	
	The drawing in *Ex herbis* is close to *Capparis spinosa*, but the text is completely unrelated to D.'s. The common caper, or wood caper, is a different plant described in D.'s 4.166 as spurge. Bierbaumer identifies the Old English woodbind as *Lonicera periclymenum* L. The picture in *Ex herbis* resembles both caper and honeysuckle.			

Ex herbis	Dioscorides	Probable scientific name	Common name	Old English (nos. to Cockayne ed.)
61. Ancusa	[4.23: ἄγχουσα; *Ex herbis* text unrelated]	*Anchusa tinctoria* L., or *Anchusa officinalis* (Font y Quer, no. 392); *Alanna tinctoria* Tausch (André, p. 30)	Anchuse, or true alkanet (Grieves, pp. 18-19)	Ancusa, no. 168 (Bierbaumer, p. 140)
	The illustrations in *Ex herbis* do not appear to be alkanet. In the text, however, *Ex herbis* describes two kinds: the first fits the description of *Anchusa tinctoria* and the second that of *A. officinalis*.			
62. Cynosbatos	[1.94: κυνόσβατος; *Ex herbis* text unrelated]	*Rosa canina L.*, or *Rose sempervirem* (cf. André, p. 112)	Dog rose or Wild briar (Polunin, no. 432)	Cynosbastos, no. 170 (Bierbaumer, p. 142)
	Drawings in *Ex herbis* resemble *R. canina*. Cockayne (I, 300-301) believes that the Old English version describes and draws *R. sempervirens* L., which Kraemer (p. 289) says is found only in Asia and Africa, but Polunin (no. 430) observes is located in the Mediterranean and south western Europe.			
63. Anagallis	[2.178: ἀναγαλλίς; *Ex herbis* text unrelated]	*Anagallis arvensis* L. (André, p. 30)	Scarlet pimpernel (Polunin, no. 967)	Spreritis, no. 138 (?) (Bierbaumer, p. 146)
	Gunther (p. 223) says D. is describing two plants, *A. arvensis* and *A. coerulea*, or blue pimpernel. Cockayne (I, 257) identifies the Old English no. 138 – spreritis - as scarlet pimpernel, but the text does not relate to *Ex herbis*.			
64. Panacia	3.48: πάνακες Ἡράκλειον	*Gladitsia farnesiana* L., or *Opopanax chironium* Koch (Font y Quer, no. 356; cf. André, p. 236)	Opoponax (Grieves, pp. 600-601; Polunin, no. 491)	
65. Purpurea	4.121: ἴον	*Viola odorata* L. (Font y Quer, no. 175); *Viola purpurea* (André, p. 170)	Sweet violet (Grieves, pp. 834-839; Polunin, no. 774)	Viola purpurea, no. 166 (Bierbaumer, p. 147)
66. Camalention; zamalention	[3.8: χαμαιλεών λευκός, *Ex herbis* unrelated; entry already in *Ex herbis*, no. 8]			
	The drawing in Vienna, Ms. 93, does not resemble *Chamaileon leuka* or *Atractylis gumnifera*, pine thistle, which drawings in nos. 66 and 67 are close to one another; see entry in no. 8; André (p. 340) noted *Zamalention* in *Ex herbis* but could be identify it.			
67. Camalention masculis; Zamalention masc.	[3.9: χαμαιλέων μελας; *Ex herbis* unrelated]			
	Pliny (22.21.47) says that the male variety is darker in color. It is possibly *Cardopatium corymbosum* L. Pers. (Polunin, no. 1463).			
68. Sion	2.127: σίον	*Sium latifolium* L.	Water parsnip (Polunin, no. 870)	*Sion* = *laber* no. 136 (Bierbaumer, p. 74)
	D.'s entry is probably *Sium nodiflorum* (Gunther, p. 167), but sium is now water parsnip. The Old English version gives the name as *laber*, which is *Porphyra laciniata* and *Ulva latissma* (see Cockayne, I, 255). Bierbaumer identifies it as *Sium latifolium*, or water parsnip. The description in *Ex herbis* seems closest to water parsnip although it could possibly be *Stratiotes aloides*, or water soldier (Polunin, no. 1565). Puschmann (II, 564-565) believes *Sion* in Alexander Trallianus may be *Sium latifolium*. André does not enter it, whereas Carnoy (p. 245) identifies Theophratus' *Sion* as *Sion qraecum*.			
69. Lichnis	[3.100: λυχνίς στεφανωματική; *Ex herbis* text unrelated]	*Lychis coronaria* L. Dest. (André, p. 192)	Rose campion (Polunin, no. 158)	
70. Abrotonum	3.24: ἀβρότονον	*Artemisia arborescens* L. (Font y Quer, p. 824; Carnoy, p. 1)	Southernwood; shrubby wormwood (Grieves, pp. 754-755; Polunin, no. 1438)	Abrotanum, no. 135 (Bierbaumer p. 140)
71. Aparine; filantropos	3.90: ἀπάρινη	*Galium aparine* L. (Font y Quer, no. 531; Carnoy, p. 30, cf. André, p. 3)	Cleavers goosegrass (Polunin, no. 1023)	

FROM GALEN TO ALEXANDER, ASPECTS OF MEDICINE AND MEDICAL PRACTICE IN LATE ANTIQUITY*

VIVIAN NUTTON

When, in the sixteenth century, the monks of the Great Lavra on Mt. Athos commissioned a new scheme of paintings for their refectory, one wall was covered with a magnificent tree of Jesse, with, at its foot, various pagan sages who, in some way, had foretold the truth of Christian doctrine. Prominent among them, between Aristotle and the Sibyl, stands Galen the righteous healer.[1] How this physician, born in A.D. 129, came to figure in such a parade of witnesses is a long and complicated story which, at its lowest level of explanation, graphically illustrates the place of medicine in Byzantine society as subordinate to theology, yet necessary. Byzantine medicine, which is traditionally taken to mean the medical theories and practices which are found in the Roman Empire from the fourth century onwards, is by no means easy to categorize. Few handbooks give it more than a passing mention, usually in despair at the paucity of accessible material, and even modern scholarly articles are depressingly few. The old survey by Iwan Bloch still retains its value as a description of a slowly changing system of medicine allegedly embedded in an almost equally static society.[2] Yet this state of affairs is a measure of our failure to exploit an abundance of material from a variety of sources, pagan and secular, Greek, Syriac, and Arabic, medical, theological and historical. Above all, with but rare exceptions, historians of medicine have been content to go over the same ground and to reach the same conclusions, without looking beyond a few limited sources or employing their critical faculties as historians.

My survey of the medicine in late antiquity has two aims: first, to suggest some guidelines for the study of Byzantine medicine; and secondly, to locate the medicine of late antiquity firmly within its social and intellectual context. Such a programme would be indeed vast, yet because several of the papers in this volume will take up and develop many of the particular points I wish to make in this introduction, I shall confine myself to setting out some of my general conclusions and leave the detailed discussion to others. This has the advantage that the links and interactions between the various aspects of medicine and medical practice may stand out clearer in this broad survey, and that general considerations that affect the whole of the medicine of the Byzantine world can be spelled out before some of their particular emphases are described. A chronological division in the mid-sixth century also allows the historian to observe both short- and long-term trends, which can become obscured or disappear if viewed in the context either of a single generation or of the many centuries that separate the foundation of Constantinople from the Muslim Conquest. The neglect of Byzantine medicine owes not a little to this chronological com-

[The reader is referred to the list of abbreviations at the end of the volume.]

*I am grateful to John Scarborough and Ihor Ševčenko for help and advice. My greatest debt is to the late A. H. M. Jones, who first introduced me to the problems and delights of late antiquity.

[1] Photographs in G. Millet, *Monuments de l'Athos*, I, *Les peintures* (Paris, 1927), pl. 151; P. Huber, *Athos* (Zürich, 1969), pl. 193; P. Yiannias "The Wall Paintings of the Lavra" (Diss., Univ. of Pittsburgh, 1971), pl. H.1 (curiously calling Galen Palenos, p. 289). A much earlier painting, "in Byzantine style," from the cathedral at Anagni in Southern Italy shows both Hippocrates and Galen; A. Cherubini, *I medici scrittori dal XV al XX secolo* (Rome, 1977), 27. On the function of pagan sages in such paintings, see, e.g., C. Mango, "A Forged Inscription of the Year 781," *Zbornik Radova*, 8 (1963), 201–207; G. Nandris, *Christian Humanism in the Neo-Byzantine Mural Painting of Eastern Europe* (Wiesbaden, 1970), 24–44, but this account is somewhat confused.

[2] Iwan Bloch, in M. Neuburger, J. Pagel, *Handbuch der Geschichte der Medizin* I (Jena, 1902), pp. 481–588. The survey of medical literature by Hunger, "Medizin," 263–320, updates Bloch for the purely literary medical evidence.

pression of a millennium or more into a few pages, in which, almost inevitably, slow developments of doctrine or therapies are transformed into a solid, unyielding and unchanging monolith. By being viewed within a particular historical context, Byzantine medicine takes on a more dynamic form, and some of the anachronisms that have bedeviled its study can be eliminated.

The most obvious difference between the medicine of the second and that of the sixth century A.D. can be summed up in one word, Galenism, in both its positive and its pejorative meanings. Instead of the variety of great names that can be cited for the second century—Galen, Rufus, Soranus, Antyllus, maybe even Aretaeus—and the evidence from both literary and epigraphic texts for new interests and ideas on surgery, the fourth and later centuries present us with a dull and narrow range of authors—the summarizers, the encyclopaedists—who have been studied not for themselves but for the earlier sources they happen to encapsulate. Oribasius, Aetius, Alexander, Paul are the medical refrigerators of antiquity: we are concerned with their contents, not their mechanics or their design. Yet this is our fault, not theirs. Ancient historians have long enjoyed the advantages of Whiggishness, without its reproaches. We can happily talk about Hippocratic medicine and its medical achievements in the same breath, because almost everything in the Corpus counts as an achievement through being the earliest recorded example in Europe of, for example, the connection of tuberculosis and a hunched back. We can accept Galen almost without question at his own estimation, because his own ideas on medicine, on research, on progress, coincide to a great extent with our own; and we can warm to a man whose stated commitment to the truth above all else would not be out of place today. Yet, faced with the great compendia, we find it difficult to understand them, apart from noting the range of their sources. There is no obvious commitment to research, to private investigation, even to argument and criticism. In them medicine appears to stand still, somehow to be frozen, to return to my earlier metaphor of the refrigerator. We are in a quandary also because our conception of how medicine works has changed drastically; and it is not surprising that the last major work of medico-historical value to be done on them was over a century ago by Francis Adams, whose third and final volume of his great translation of Paul appeared in 1847. The reason for this is simple: to Adams, Paul was transmitting a living medicine, one that could still be used in his daily practice in Scotland, and it was precisely for this reason that Adams, on the basis of his own experience as a doctor, could reach such a sound judgment on the merits of this compiler.[3]

We should approach the problem of the medical learning of these encyclopaedists of late antiquity with a variety of questions. Obviously, we must be interested in the sources they had at their disposal, and it is entirely legitimate to draw conclusions from them as to the spread of Galenism in late antiquity. It is indeed a lengthy process, largely illuminated for us by Owsei Temkin, and its outlines are clear.[4] Galen already enjoyed a high reputation in his own lifetime, certainly in the Greek-speaking half of the Empire. Theodotus the shoemaker, Athenaeus of Naucratis, and Alexander of Aphrodisias, in their own ways, attest his influence among his contemporaries as doctor and philosopher.[5] Some of his philosophical writings enjoyed lasting fame. As late as the fifth century, Marinus of Sichem, the biographer and pupil of Proclus, is said to have dissented from his master's views on Plato's Parmenides in favor of the erroneous ones of Galen and Firmus.[6] Later still, Galen's scientific writings were known, in part, to Philoponus, and some of his little tracts on logic and morals have come down to us in Greek or in Arabic.[7] If Galenic philosophy retained some influence, Galenic medicine was far more important. It is clear that Oribasius, for example, took Galen as his main source, supplementing him, where necessary, as with his comments on the plague, from other authors such as Rufus of Ephesus.[8] This was not a purely personal decision by Oribasius, a mere whim. It reflected

[3] Paul (trans. Adams), *passim*. The German version of Paul, by J. Berendes, *Des besten Arztes sieben Bücher* (Leiden, 1914), though useful, lacks a substantial commentary. Recent scholarship has added little to the older assessment of Adams by C. Singer, "A Great Country Doctor: Francis Adams of Banchory," *BHM*, 12 (1942), 1–17.

[4] O. Temkin, *Galenism* (Ithaca and London, 1973). See also his articles: "Geschichte des Hippokratismus im ausgehenden Altertum," *Kyklos*, 4 (1932), 1–80; "Byzantine Medicine: Tradition and Empiricism," *DOP*, 16 (1962), 97–115 (= *The Double Face of Janus* [Baltimore and London, 1977], 202–22).

[5] O. Temkin, *Galenism*, 55–61: *contra*, J. Scarborough, "The Galenic question," *SA*, 65 (1981), 1–31. I shall confirm Temkin's assessment, with new material, in a forthcoming article in *BHM*, 1984.

[6] Damascius, *Vita Isidori*, in Photius, *Bibl.* 351B. For Galen and Hippocrates as philosophers, cf. Gregory Nazianzen, *Or.* VIII.20.

[7] For Philoponus, see R. B. Todd, "Philosophy and Medicine in John Philoponus' Commentary," in this volume; for the Arabs, cf. G. Strohmaier, "Galen in Arabic: Prospects and Projects," in Nutton, ed., *Galen: Problems*, 187–96.

[8] Cf. H. Mercurialis, *De peste . . . praelectiones* (Basle, 1577), 11.

the growing importance of Galen, and the belief, easily induced by Galenic rhetoric, that he had somehow defined and completed medicine. Hippocrates sowed, Galen reaped, says one commentator;[9] all that was left to others was thus gleanings from the stubble.

Yet the encyclopaedists were not just compilers; they had to select. They were constantly adding fresh material or compressing the old; they were not dumb copyists. My reading of Oribasius fills me with admiration for his broad knowledge of Galen, for his ability to summarize and yet keep in as much of the original as possible, and, most importantly in an age that valued rhetoric highly, for his skill in expressing its essentials clearly. It is this sort of categorization that we should employ when looking at the compendia, to try and see them on their own terms, and to judge them on their ability to put across an effective message. They must be seen as the equivalent of Osler's *Principles and Practice of Medicine*, not of a research monograph.

It is in this light, too, that we should approach such authors as Cassius Felix, Magnus of Nisibis and Caelius Aurelianus, enough of whose writings survive to enable us to form a reasonably critical judgment on them. They have in the past been dismissed crudely as translators, or mere abbreviators, of earlier writings by Galen or Soranus.[10] But this is far too simple. Jackie Pigeaud's recent work on Caelius has shown how that author adapts his material, occasionally criticizes it, and produces a large work of considerable elegance and effectiveness.[11] Magnus of Nisibis was celebrated for his rhetoric and his logic, though his practical abilities and experience, to say nothing of his character, were less impressive.[12] His book on urines, which survives in Arabic and in part in the second volume of Ideler's *Physici et Medici Graeci*, and which is a restatement of Hippocratic and Galenic doctrine, was highly regarded by succeeding generations. It was mentioned by Theophilus, for whom it was a major source, and by Johannes Actuarius; it was translated into Arabic, and, finally, excerpted by Byzantine doctors.[13] Theophilus' mild criticism does not justify the almost total neglect of Magnus by modern scholars, and in fact it tells us what Magnus' audience was looking for. He is praised for his attempts to systematize and arrange in order the various urines, by their types and by their differences, but condemned for failing to include all their diagnostic and prognostic indications. His teaching was therefore left incomplete (partly from his lack of first hand experience), but his was the argument and organization followed by subsequent writers on the subject.[14] As Gerhard Baader his pointed out, in earlier diagnostic theory uroscopy plays a very minor part—although Galen's practice in no way neglected it—whereas late antiquity and the Middle Ages elevated it to being the major guide to diagnosis. In this development the role of Magnus may have been crucial.[15]

It would be wrong to conclude, too, that summaries, handbooks, and collections of drugs, such as we find with pseudo-Apuleius and Marcellus Empiricus, are new phenomena in late antiquity. One of the most important of the lost works of Rufus was his big compendium *For the Layman*, to which may be plausibly attributed many short excerpts preserved under his name by later encyclopaedists.[16] Galen summarized not only his own books on pulses but also the *Anatomy* of Marinus and various Platonic dialogues, and his *Therapeutics, for Glaucon*, was deliberately designed as a brief introduction to medicine for a layman.[17] Scribonius Largus and Marcellus Empiricus are separated as authors of recipe collections only by the centuries, not by any development in their aims and methods.[18] Yet one significant development which *can*

[9] Palladius, *In Epid. VI scholia*, p. 157 Dietz.

[10] E.g., I. E. Drabkin, "Soranus and His System of Medicine," *BHM*, 25 (1951), 503–18.

[11] J. Pigeaud, "Pro Caelio Aureliano," *Mémoires du Centre Jean Palerne*, 3 (1982), 105–17. A similar conclusion has been reached by G. Harig and D. Nickel in their preparatory studies for a new edition of Caelius in the *CML* series.

[12] Eunapius, *Vit. phil.* 497 ff.; Philostorgius, *Hist. eccl.* VIII.10; Libanius, *Ep.* 497; for his character, see Libanius, *Epp.* 1208, 1358.

[13] Theophilus, *De urinis*, pref. (p. 261 Ideler); Johannes Actuarius, *De urinis* I.2 (p. 5 Ideler). For manuscripts and the later revisions and editions, see Galen (ed. Kühn), XIX. 574–601, 602–608; Anonymous, *De urinis*, pp. 307–16 Ideler; H. Diels, *Die Handschriften der antiken Ärzte*, II (Berlin, 1906), 59 f.; F. Sezgin, *Geschichte des arabischen Schrifttums*, III (Leiden, 1970), 165 f.; M. Ullmann, *Die Medizin im Islam* (Leiden, 1970), 81 f.

[14] Theophilus, *De urinis*, pref. (p. 261 f. Ideler).

[15] G. Baader, "Early Medieval Latin Adaptations of Byzantine Medicine in Western Europe," in this vol. Hence the translation into Greek of Avicenna's chapters on urine, pp. 286–302 Ideler; and of similar books in Syriac and Persian, pp. 303–16 Ideler. For Galen's practice, cf. Nutton, ed., *Galen: On Prognosis*, 2 (*CMG* V 8,1, p. 80), but undoubtedly it is by the pulse that Galen mainly made his diagnoses, and his interest is more in the quantity and frequency of urination than in the quality of urine.

[16] So, rightly, J. Ilberg, "Rufus von Ephesos. Ein griechischer Arzt in trajanischer Zeit," AbhSächsAkadWiss (1931), 45 ff.

[17] Galen, XIX.25–30 K.; XIX.46 K.; XIX.31 K.

[18] The arguments of P. Brown, *The Cult of the Saints* (London and Chicago, 1981), 113 ff., on the place of Marcellus Empiri-

be discerned in late antiquity is the accentuation of the divorce between practical and theoretical texts. Magnus of Nisibis was clearly a theoretical professor, and recent studies on John of Alexandria and Agnellus have shown how their lectures became more and more devoted to extensions of theory, rather than to practical purposes.[19] But this tendency was not itself new; Galen complained about it in his own day, and the format of lectures and commentaries on particular texts only encouraged this sort of logical or philological specialization.[20] I wonder, too, whether the magnitude of Galen's own achievement, with its stress on the indissoluble unity of theory and practice, did not frighten succeeding generations of scholars with the thought of the learning needed to combat Galen *in toto* and, at the same time, console them by suggesting that a concentration on one aspect of medicine would necessarily bring about improvements in others.

Yet it would be foolish to deny the effect of Galenism, an effect so powerful that a poet could, in a wonderful trope, refer to Christ as a second (and neglected) Galen.[21] Hippocrates comes to be studied through Galen's eyes, even through Galen's text,[22] and the theories of his opponents are pushed to the fringes of the scientific community, to Latin-speaking Africa and the collectors of popular scientific curiosities, the *Problemata*, like pseudo-Alexander and Cassius the Iatrosophist.[23] Other medical sects passed peacefully away. The last recorded Greek doctor who claimed to be a follower of Asclepiades lived around 350 A.D., and I prefer to believe that those doctors on Byzantine epitaphs who call themselves "men of the spirit," πνευματικοί, are confessing their faith rather than their medical learning.[24] Not that we should regard the medicine of the late antiquity simply as a degenerate form of Galenism. There were bold spirits prepared to put forward their own ideas—Alexander of Tralles, for example, and Jacobus Psychrestus. This great philosopher, beloved by emperor and people alike, honored with statues at Athens and Constantinople, who ordered the rich to aid the poor, who treated those in poverty without fee, relying only on the *annonae* given him as a civic doctor, this paragon of learning and experience gained his fame, his influence and indeed his nickname, Psychrestus, from a radical new technique. He treated his patients with cooling waters, as a means of reducing their tensions and worries about money.[25] Yet even here we may find an earlier precedent in the Augustan physician, Antonius Musa, whose cold water treatments succeeded in curing the emperor Augustus, but may have hastened the death of his favorite heir, Marcellus.[26]

Nor does experimentation cease immediately on the death of Galen or in the darkness of the third century. True, we no longer have records of the medical contests at Ephesus, but Nemesius of Emesa apparently preserves details of the anatomy of the tongue that derive from fourth-century Alexandria.[27] A similar conclusion might be drawn from the discussion of the tongue in the pseudo-Galenic *De motibus liquidis*, which, in the form in which it survives, is a Latin translation going back via Arabic to a Syriac original.[28] But both Nemesius and the Syriac author may be deriving their information direct from some lost tract of Galen, and the anatomical progress they show over Galen may therefore be illusory. A detailed programme of anatomical research such as we can see in Galen, and

cus in the Western world of healing are suggestive, but not conclusive. Cf. also B. Merlette et al., "Le manuscrit 420 de Laon et la médecine carolingienne," *Histoire des sciences médicales*, 14 (1980), 51–69.

19 Agnellus of Ravenna, *Lectures on Galen's De sectis* (Buffalo, 1981); C. D. Pritchet, *Iohannis Alexandrini in librum de sectis Galeni* (Leiden, 1982); cf. O. Temkin, "Studies on Late Alexandrian Medicine," *BHM*, 3 (1935), 405–30 (= *The Double Face of Janus*, pp. 178–97).

20 See, for example, Galen, *CMG* V 10,1, 420 f.; XVIIA.496–524 (*CMG* V 10,2,1, 10–26).

21 George of Pisidia, *Hexaemeron*, 1.1588 f.

22 B. Alexanderson, *Die hippokratische Schrift Prognostikon* (Göteborg, 1963), 169; J. N. Mattock, M. C. Lyons, eds. and trans. (Arabic) *Hippocrates: On the Nature of Man* (Cambridge, 1968), viii.

23 See the evidence collected in my article "The Seeds of Disease: An Explanation of Contagion and Infection from the Greeks to the Renaissance," *Medical History*, 27 (1983), 9–13.

24 From Cibyra Minor in Cilicia, DenkWien, 102 (1970), 65, n. 38 and pl. 52; on πνευματικοί, *CIG* 9578, 9792; cf. *Vita S. Marthae*, ed. P. Van den Ven (Brussels, 1970) ch. 51.17.

25 *Chron. Paschale*, PG 92.824A; *Suda, s.* Ἰάκωβος; Malalas, *Chron.*, p. 370 Dindorf; Marcellus, *Chron.*, p. 88; Photius, *Bibl.*, 344A; *Suda, s.* Σωρανός (confusing Soranus of Ephesus and Soranus of Mallus ?); Alexander, II.163 Puschmann.

26 Suetonius, *Aug.* 59; Cassius Dio, 53.30; cf. F. Atterbury, *Antonius Musa's Character Represented in the Person of Iapis* (London, 1742). A similar therapy was advocated by Charmis of Massilia, Pliny, *NH* 29.5.10, under the emperor Claudius, cf. *ib.* 29.8.22 and Galen, XIV.80.K.

27 For Ephesus, J. Keil, "Ärzteinschriften aus Ephesos," *ÖJh*, 8 (1905), 128–38; *Die Inschriften von Ephesos*, VI, 1160–69. For Nemesius, *De nat. homin.* 8, 14 (pp. 195 ff., 208 f. Matthiae, cf. p. 404 f.), with the arguments of W. Telfer, *Nemesius of Emesa, On the Nature of Man* (London, 1955), 331.

28 Ps.-Galen, *De motibus liquidis*, in Galen, *Opera omnia*, ed. R. Chartier (Paris, 1679), V, pp. 400, 403–405. On the question of authenticity, cf. Galen, II.443 K.; XVIIIB.931 K., and the summary of J. C. G. Ackermann, in Galen, I.clxii K. Cf. also the discussion of H. Baumgarten, "Galen, Uber die Stimme" (Diss., Göttingen, 1962), 88–93. The problem will be discussed in a forthcoming article by Dr. J. Wollock.

earlier in Rufus and Satyrus, cannot be shown to have survived the fourth century. But before we condemn late antiquity too harshly, we must note that Galen himself believed that anatomy had almost disappeared between the age of Herophilus and Erasistratus and that of Marinus, four hundred years later: the tradition of anatomical research is a very fragile thing.[29]

One should not, however, confuse the absence of experimental anatomy on the Galenic model with a declining interest in practical techniques, including surgery. John of Ephesus describes a surgeon relieving a painful condition by the permanent insertion of a drainage tube.[30] The medical reputation of Alexandria also rested on more than the theoretical content of its lectures. The fourth-century professor Ionicus, according to his biographer Eunapius, was skilled in knowledge of all parts of the body, and possessed great practical skills in surgery and bandaging.[31] A few years later, a lawyer friend of St. Augustine, Innocentius, who had rejected the advice of two distinguished local doctors at Carthage, was quite prepared to accept it when it came from an Alexandrian doctor, even though it entailed a complicated and painful operation.[32] Happily for him, God intervened, and his anal fistula was found to be miraculously healed.

The intervention of God brings me on to my second broad section, the position of medicine and medical men within a Christian society. In a recent article, Darrel Amundsen has strongly argued that, on the whole, Christianity was favorable to medicine, or at any rate, not hostile[33]—a conclusion with which I would agree—yet this argument is rather too bland, and misleading on one important point. As Harnack long ago showed, Christianity is a healing religion *par excellence*.[34] The New Testament emphasizes the power of Christ and his apostles to cure diseases, and this was one of the features that secured for Christianity the primacy among competing religions. Similarly, Ramsay MacMullen has recently pointed to the crucial significance of healing miracles in securing the allegiance of intellectual doubters and of the ordinary people to Christianity.[35] Yet this Christian healing was not that of the doctors. It succeeded where they had failed, often over many years and at great expense; it was accessible to all; it was simple. It was a medicine of prayer and fasting, or of anointing and the laying on of hands.[36] The power to heal was given to Christian elders, and they were to be consulted first in all cases of illnesses.[37]

There is, thus, a tension, to put it at its lowest, between the model of the New Testament and the real world outside. It is not that Christianity is necessarily opposed to secular healing; but it presupposes an alternative medicine on which true Christians may be expected to rely. How many Christians actually followed this expectation is unknown, and unknowable. But it is a doctrine that surfaces from time to time among the ascetics and among the more fundamentalist Christians like Tertullian, Tatian, Marcion, even Cyprian. But even those who, like St. Basil, knew and approved of secular medicine, were always careful to leave room for this peculiarly Christian type of healing. The tension was almost palpable, and we can find various theologians endeavoring to hold it in balance. One example, chosen at random, is St. Diadochus of Photike, a monk of northern Greece, who wrote his "On Spiritual Knowledge," about 480 A.D.[38] In Diadochus' view, there is nothing to stop a Christian calling in a doctor when he falls ill. Divine providence has implanted remedies in nature, and hence human experience has developed the art of medicine. But, all the same, our hope of healing should not be placed in doctors but in the true savior Jesus Christ. Ascetics in monasteries or in towns, because of their environment, cannot always maintain that perfect charity necessary for the efficacy of faith for healing. To them Diadochus recom-

[29] Galen, XV. 136K; cf. A. Vesalius, *De humani corporis fabrica* (Basle, 1543), fol. 3r.-v.

[30] John of Ephesus, PO 18, p. 643 f.; see below, pp. 88 f.

[31] Eunapius, *Vit. phil.* 499.; W. C. Wright, the Loeb translator, p. 537, confuses the issue further by translating ἡ καθ' ἕκαστον πεῖρα, not as "in every type of experience," but as "in every kind of experiment," with its implications of medical research. But πεῖρα is regularly used as the counterweight to λόγος, mere theory.

[32] Augustine, *Civ. Dei* XXII.8. Note also the hostile comment of Fulgentius, *Mitologiae*, p. 9 Helm (cf. c. 523), on an Alexandria whose streets were crammed with the stalls of surgical butchers, all killing their patients.

[33] D. W. Amundsen, "Medicine and Faith in Early Christianity," *BHM*, 56 (1982), 326–50. Both this article and the excellent collection of essays edited by W. J. Sheils, "The Church and Healing," *Studies in Church History*, 19 (1982), would have benefited from a closer attention to and exposition of the New Testament evidence.

[34] A. Harnack, "Medicinisches aus der ältesten Kirchengeschichte," Texte u. Untersuch. 8.4, 1892, pp. 37–152; H. J. Frings, "Medizin und Arzt bei den griechischen Kirchenvätern bis Chrysostomos" (Diss., Bohn, 1959) is a very useful collection of primary material.

[35] R. MacMullen, *Paganism in the Roman Empire* (New Haven and London, 1982), 95 f., 135.

[36] E.g., Mark, 7.31, Luke, 5.18, 6.18, 8.41, 9.37, 11.14. Cf. Arnobius, *Adv. gent.* I.45–50.

[37] James, *Ep.* 5.13–18. A study of patristic exegesis of this passage would repay the effort.

[38] St. Diadochus of Photike, *On Spiritual Knowledge*, chs. 53–55.

mends that they should not succumb to the deceits and temptations of the devil, who has induced some of them to boast publicly that they have not needed a doctor for many years. But hermits in the desert can draw near the Lord, who heals all kinds of sickness. And moreover, the solitary hermit has the desert itself to provide consolation in his illness. Concern for the body, and worries about illness, indicate that the Christian has not yet emancipated himself from the desires of the flesh, has not yet cultivated the true dispassion that waits joyfully for death as the gateway to a truer life.

This rejection of doctors in favor of spiritual medicine is particularly marked in the Lives of the Saints. Not all of them are as hostile as the biographer of St. Artemius, but throughout there runs a current of dislike of doctors, overtly for their high fees and their failures, which is hardly to be found in similar healing stories from the pagan side.[39] Aelius Aristeides remained a personal friend of doctors like Satyrus, and doctors contributed generously to healing shrines.[40]

Besides, despite Arnobius' boast that doctors of genius were turning to Christianity, the medical profession was always suspect as a stronghold of paganism and heresy.[41] Oribasius, Agapius of Alexandria, Asclepiodotus of Aphrodisias, Jacobus Psychrestus and his father, these are but a few of the famous doctors of the fourth and fifth centuries whose paganism was overt.[42] As for Gesius, professor of medicine at fifth-century Alexandria, "whose rhetorical expertise removed all difficulties of medical exposition," and whose diagnosis was "a bright light that would bring a sure relief," he might be officially a Christian, but his sympathies were clearly with his pagan friends.[43] He protected the pagan philosopher Heraiscus after he had tried to defend the oracle of Menuthis from Christian attack, and, says Sophronius, he treated his Christianity lightheartedly. His punishment for announcing that the cures of SS. Cyrus and John were purely natural and not miraculous was to be attacked by a disease that defied all treatment by the doctors. It was only removed after Gesius had made a contrite confession of his impiety.[44] Fifty years later, John of Ephesus denounced in the persecutions of Justinian an indiscriminate collection of grammarians, sophists, lawyers and, finally, doctors.[45]

Heresy was also linked with medicine. The Adoptionists, led by Theodotus the shoemaker, had even by 210 been led astray by Galen in applying logic (and textual criticism) to their sacred texts.[46] Later still, the career of Aetius, with its sudden switches from tinker to schoolmaster to doctor and to heretical theologian, offers an interesting example of the ease with which a man of ability and flair could set himself up as a doctor.[47] Yet even Aetius' bitterest opponent, Gregory of Nyssa, allows that he cured some of his patients and that he made a reputation by intervening in medical debates.[48] At times too, a priest might be protected by his medical skills, even if his morals were dubious and his theology unsound. Gerontius of Milan, doctor and deacon, defied St. Ambrose's instructions to remain in Milan and await investigation for his claim to have seen a demon, and fled to Constantinople. Powerful friends secured his prefer-

[39] *Miracula S. Artemii*, ed. A. Papadopoulos-Kerameus, *Varia graeca sacra* (St. Petersburg, 1909), *passim*, esp. pp. 3, 4, 24, 26. P. Hordern, "Saints and Doctors in the Early Byzantine Empire: the Case of Theodore of Sykeon," *Studies in Church History*, 19 (1982), 1–13, is an excellent and sober survey. H. J. Magoulias, 'The Lives of the Saints as Sources of Data for the History of Byzantine Medicine in the Sixth and Seventh Centuries," *BZ*, 57, (1954), 127–50, adds some further details, but is very unreliable. As Hordern rightly emphasizes, not all Christian healers opposed secular healing: the biographer of SS. Cosmas and Damian is glad to acknowledge their expertise (ἐκμελετήσαντες) in Hippocratic and Galenic medicine, although, of course, they regarded the healing sent from god as "safer" (ἀσφαλέστερον), Vita SS. Cosmae et Damiani, *AnalBoll*, 1 (1882), *sect.* 4.

[40] Aelius Aristeides, *Or.* 49.8–10.

[41] Arnobius, *Adv. gentes* II.5.

[42] See on this, A. Moffatt, "Science Teachers in the Early Byzantine Empire: Some Statistics," *Byzantinoslavica*, 24 (1973), 15–18.

[43] Photius, *Bibl.* 352B; *Suda, s.* Γέσιος; the quotations come from Aeneas of Gaza, *Ep.* 20, and Procopius of Gaza, *Ep.* 102. Cf. also Aeneas, *Ep.* 19; Procopius, *Epp.* 16, 102, 122, 125; Zacharias Schol., *De opificio mundi*, PG 75.1016, including him as an interlocutor in his debate on creation, *ib.*, 1060–1106. Of his medical works nothing can be shown to have survived (but note Vatican, Pal. lat. 1090, ff. 1r.-42v., commentary on Galen's *De sectis*, elsewhere attributed to Agnellus). Traces of his activity as a commentator can be found in Dietz, II, 343, n. 4; and in G. Bergsträsser, "Ḥunain ibn Isḥāq, "uber die syrischen und arabischen Galen-Ubersetzungen", AbhKM, 17.2 (1925), p. 36, n. 101. His name also appears in connection with the vexed question of the *Summaria Alexandrina*, see E. Lieber, "Galen in Hebrew: The Transmission of Galen's Works in the Mediaeval Islamic World," in Nutton, ed., *Galen: Problems*, 167–86, esp. p. 177 with nn. on p. 185.

[44] Zacharias Schol., *Vita Severi*, PO, 1, 27–32, gives a graphic description of the attack on Menuthis, but without mentioning his friend Gesius. For his part, see Sophronius, *Mirac. SS. Cyri et Iohannis* 30: PG 73.3513–17.

[45] John of Ephesus, *Eccl. Hist.*, *ROChr*, 2 (1897), 481 f.

[46] Eusebius, *Eccl. hist*, V.28: H. Schöne, "Ein Einbruch der antiken Logik und Textkritik in die altchristliche Theologie," *Festschrift F. Dölger*. (Münster, 1939), 252–66; R. Walzer, *Galen on Jews and Christians* (Oxford, 1949), 75–86.

[47] Philostorgius, *Eccl. hist.* III.15; Sozomen, *Eccl. hist.* III.15.

[48] Gregory Nyss., *Contra Eunomium* I.42, 45, cf. Philostorgius, *loc. cit.*

ment to the bishopric of Nicomedia, and when the angry Ambrose gained the assistance of John Chrysostom, the patriarch of Constantinople, in deposing him, the inhabitants of Nicomedia made vigorous complaints, praising Gerontius' unstinting use of his abilities among them as a doctor.[49] They were clearly more concerned for their bodies than their souls, like the Christians who secured the deposition of the orthodox bishop Basil of Ancyra for failing to excommunicate a quack who had killed several patients.[50]

It should not be forgotten that, for long after Constantine's conversion, large parts of the empire remained steadfastly pagan, and that the traditional healing shrines continued for many years to attract large numbers of patients. In England, the shrine of Nodens at Lydney enjoyed its best days in the late fourth and early fifth century,[51] while the Lives of SS. Cosmas and Damian and, in particular, SS. Cyrus and John reveal the vigorous activities of such shrines in Asia Minor and Egypt.[52] The letters of Libanius make several references to the cult of Asclepius, while the Life of Damascius, from the late fifth century, often mentions pagan healing shrines and, in particular, theurgy, the pagan equivalent of Christian miracle.[53]

As is well known, Christianity took over from pagan healing cult not only its function as a source of medical treatment but also its language, its imagery, even its sites. *Christus medicus* is a metaphor that has been often studied, and Erich Dinkler has recently discussed the artistic borrowings of Christianity from Asclepius cult.[54] At Caesarea Philippi a statue traditionally supposed to represent Jesus and the woman with the issue of blood has been plausibly argued to have been either a statue of an emperor with the epithet *Soter*, Savior, or one of Asclepius.[55] Pagan shrines became Christian temples. A Christian basilica was constructed at the Asclepieion at Epidaurus; the Asclepieion at Rome is now the church of S. Bartolommeo and the healing spring its font, and churches dedicated to St. Michael often replaced healing shrines to Heracles.[56] The Christian hatred of these pagan shrines is best attested at Pergamum, where there was a deliberate destruction of all the cult images, big or small, of Asclepius. The result is that our information on them depends on literary descriptions in Galen and on chance survivals of representations of the cult statue from the Black Sea region.[57]

There are borrowings too among pagans from Christianity. The increase in pagan miracles, in theurgy, that is associated with the philosophers and doctors of late antiquity, like the two Asclepiodoti, is in one sense a deliberate reaction against Christian doctrines, and Julian's attempts to impose the cult of Asclepius as the center of paganism can only be understood against a background of Christianity as a healing, missionary religion.[58] It was Julian also, who, in a famous letter to the high priest of Galatia, encouraged pagans to follow the examples of Jews and Christians in their practical efforts to remedy social problems. Pagans, like their opponents, were to look outwards, and to care for their friends and fellow believers; charity was a means of proselytism.[59]

The early centuries of the Christian empire show a reformation of problems about health and healing. Professor Amundsen has rightly emphasized the new attitudes towards sickness and suffering, which combine the Stoic doctrines of indifference

[49] Sozomen, *Eccl. hist.* VIII.6.

[50] *Ibid.*, IV.24. It is perhaps worth noting that, apart from the story told by Galen and preserved only in Arabic (M. Meyerhof, "Autobiographische Bruchstücke Galens aus arabischen Quellen," *SA*, 22 [1929], 83), there is no evidence for prosecution of quack doctors in antiquity, and it may be doubted whether that man was prosecuted or punished for selling dangerous poisons or for impersonating a pupil of the great Galen.

[51] R. E. M. and T. V. Wheeler, *Lydney* (London, 1932).

[52] J. Geffcken, *Der Ausgang der griechischen-römischen Heidentums* (Heidelberg, 1920) remains fundamental.

[53] R. Asmus, *Das Leben des Philosophen Isidoros von Damaskios aus Damaskos* (Leipzig, 1911); E. R. Dodds, *The Greeks and the Irrational* (Oxford, 1950), 283–311.

[54] E. Dinkler, "Christus und Asklepios," SBHeid, 1980.2; K. Hauck, "Gott als Arzt," in C. Meier, U. Ruberg, *Text und Bild: Zwei Aspekte des Zusammenwirkens zweier Künste in Mittelalter und früher Neuzeit* (Wiesbaden, 1980), 19–62. For literary references, see D. W. Amundsen, *BHM*, 56 (1982), 331.

[55] Eusebius, *Hist. eccl.* VIII.18; cf. the *Passio IV SS. Coronatorum, Acta Sanctorum*, Nov. 3, for the significance to Christians of statues of Asclepius.

[56] F. Robert, *Epidaure*, (Paris, 1935), 41; M. Besnier, *L'île Tibérine dans l'antiquité* (Paris, 1902), 184–246; J. P. Rohland, *Der Erzengel Michael* (Leiden, 1977), 75–104.

[57] G. Strohmaier, "Asklepios und das Ei," in *Festschrift F. Altheim*, 2 (Berlin, 1970), 143–53. A further study by Dr. Strohmaier on the artistic representations of the cult at Pergamum is scheduled to appear in the *Proceedings of the Twenty-sixth International Congress of the History of Medicine* (Plovdiv, 1978), but so far only Vol. I has appeared.

[58] R. Asmus, "Der Neuplatoniker Asklepiodotos der Grosse," *SA*, 7 (1913), 26–42, needs to be supplemented by the epigraphic evidence provided by L. Robert, *Hellenica IV* (Paris, 1948), 119–26. The article by G. Senn, "Asklepiodotos von Alexandreia, ein positivistischer Naturforscher des V Jahrhundert," *Archeion*, 21 (1938), 13–27, is full of errors and misconceptions. For Julian, see the material collected by the passionate P. Athanassiadi-Fowden, *Julian and Hellenism* (Oxford, 1981), 166–70.

[59] Julian, *Ep.* 22.

to the pains of the body with the idea of the nobility of suffering and of, in some way, it being a test of one's faith.[60] Suffering is to be more than endured, it is almost to be welcomed. I cannot find in pagan literature anything to compare with Tertullian's view of famine and pestilence as the acceptable will of God and as the rightful cure for the prosperity and population growth he saw around him.[61] Nor would a pagan have advised a frightened congregation, as Cyprian did in 252, to accept a plague joyfully as proof of God's love: for by it the wicked were sent swifter to Hell, and the just would more quickly obtain their everlasting refreshment.[62] It is true that plague in the pagan world was often seen as the result of divine displeasure, and that the measures taken against it were regularly religious—supplications, vows, public festivals, temple building, and so on—but I cannot imagine a pagan asking the question posed in the *Moral Questions* attributed to Athanasius and summarized in the later collection by Anastasius of Sinai, "Should a man rightly flee from the plague, if, as was possible, it was sent by the wrath of God?"[63] The theologians' answer neatly sidesteps the issue: yes, if the plague has a purely natural cause, in the filth and overcrowding of the towns or in the polluted air; but the wrath of God will seek out the sinner everywhere, even in the desert, and in such circumstances, flight is in vain.

The theologians' opening response to this question also indicates some of the dangers of Christianity to the scientific mind. They apologize for talking largely about natural plagues, for they might seem to some to doubt the providence and power of God, who oversees all things, and to deny that the plague is a sign of divine displeasure. Their message is largely secular and its advice medical, not theological, but it is given with a slightly worried glance at fellow and more fundamentalist theologians. I am reminded of Alexander of Tralles' comment that he could have included in his books many more sympathetic remedies, chants and charms, but was prevented from so doing—presumably by theological difficulties, rather than by the opposition of his medical colleagues.[64]

Alexander of Tralles, a member of a distinguished intellectual family, widely traveled, well read, and by no means uncritical in the selection of his material, reveals another side of medicine in the Christian empire—the emergence into acceptability of remedies that had earlier been excluded as "falling outside the profession of medicine." That phrase had been coined c. 60 A.D. by Scribonius Largus, rejecting a remedy for epilepsy that involved the blood of a gladiator. That was rejected also by Pliny, and by Galen, but it appears in Alexander[65] as a proven remedy, frequently given. Alexander also includes many other folk remedies, many spells, amulets and charms. These were not new—some can be found in the pages of Pliny—and the names of Pamphilus and Xenocrates remind us that not every doctor was as scrupulous as a Scribonius, a Dioscorides or a Galen. The papyri of Egypt, not to speak of the pages of Ammianus, show a growing acceptance, among all classes, of the power of such amulets and charms.[66] Sophronius, bishop of Constantia, was accused in 449 of astrology, phialomancy and other kinds of divination, and of corrupting thereby Peter the *archiatros*, who had read his books on astrology.[67] There is an obvious shift between Galen's time and that of Alexander in the definition of what is or is not medically and socially acceptable as a type of remedy. We should not regard the injunctions of Alexander to pick a mandrake with one's left hand, or the instructions he gives for the correct formula to be spoken over a sufferer from gout as being new or confined to him.[68] They can be found centuries earlier, but in what we would term magical texts, or in early Roman domestic medicine.[69]

[60] D. W. Amundsen, *BHM*, 56 (1982), 334–42; cf. the (indiscriminate) collection of material in F. Bottomley, *Attitudes to the Body in Western Christendom* (London, 1979), 59–96.

[61] Tertullian, *De anima* 30; contrast, *Anth. Pal.* VII.626.

[62] Cyprian, *De mortalitate* 9.

[63] Ps.-Athanasius, *Quaest. ad Antiochum* 103, 104 (PG 28.662); Anastasius of Sinai, *Quaest. moral.* 114 (PG 89.765 f.). On the relationship between the two collections, see M. Richard, *Opera minora*, 3 (Louvain, 1977), n. 64, pp. 43–56. Cf. also the fragment of (ps.?) Athanasius on illness, *OCA*, 117 (1938), pp. 5–9.

[64] Alexander, I.573 Puschmann. See also, on Alexander, J. Duffy, below, p. 25 ff.

[65] Alexander, I.565 Puschmann; cf. Celsus, *De med.* III.23; Scribonius Largus, *Comp.* 17.

[66] Ammianus, *Hist.* XVI.8.1; XIX.12.14; XXVI.3.1–4; XXVIII.1.26–29; cf. A. A. Barb, "The Survival of Magic Arts," in A. D. Momigliano, *Paganism and Christianity in the Fourth Century* (Oxford, 1963), 100–125; P. Brown, *Religion and Society in the Age of St. Augustine* (London, 1972), 119–46.

[67] E. Honigmann, "A Trial for Sorcery," *Isis*, 35 (1944), 281–84.

[68] Alexander, II.585 Puschmann.

[69] W. H. S. Jones, "Ancient Roman Folk Medicine," *JHM*, 12 (1957), 459–72. Cf. L. Edelstein, "Greek Medicine in Its Relation to Religion and Magic," *BHM*, 5 (1937), 201–46 (= *Ancient Medicine* [Baltimore, 1967], 205–46).

Christianity, by its emphasis on prayers and spiritual songs, gave a sort of sanction to this white magic, within limits.

It also introduced, or re-introduced, into medicine the idea of demons and demoniac possession. The wolf-man wandering half naked among the tombs at night, derives his characterization in part from the gospels, in part from earlier medical texts.[70] A somatic explanation for madness is regarded as unusual even among doctors, who instead invoke demonic possession.[71] We enter upon a world filled with angels and demons, in which sickness is viewed as a symptom of a battle between competing divine agents, and in which apparitions, sent by God or Satan, are common. It was the vision sent to the dying Theodoric that compelled him to express to his personal physician, Elpidius, his deep repentance for the murders of Boethius and Symmachus.[72] Elpidius, doctor and deacon, ambassador, traveler, and restorer of a public bathhouse at Spoleto, knew demons when he saw them.[73] He is said to have been attacked by them, not only outside as they lay in ambush for him, but within his house, into which they pursued him throwing stones. In answer to his prayers, S. Caesarius came and exorcised the spirits who were afflicting him.[74]

Whether or not one believes in this tale, it expresses one truth, that in late antiquity, medical men were willing to consider the intervention of demons and spirits as a cause of disease, and disease as some form of divine punishment for sins, far more openly than they had done in the time of Galen.[75] This change of perspective has never been satisfactorily investigated from the medical side, and we should be wary of taking it as the result of such vague and unverifiable processes as Christianity's democratization of high culture.[76]

One institution, however, does seem to owe its origin to Christian charity: the establishment of hospitals open to all members of the community and providing medical treatment, alongside a variety of other services. As is well known, Roman hospitals were restricted either to estate or domestic servants, or to the members of the army.[77] And, despite the claims of S. W. Baron, Jewish hospitals until the middle ages were hostels or hospices for pilgrims,[78] and similar hostels could be equally found at most pagan shrines, where, at great festivals, a city would also secure the attendance of doctors to look after its visitors.[79] But the Christian hospital, that combination of medical center, poorhouse, old folks home, hostel and meeting place, does seem, both from its size and the variety of its functions, to be a new creation. The earliest is traditionally that of St. Basil at Caesarea in the 370s, almost a new city outside the walls, and his example was quickly followed: by Eustathius in Pontus, Pammachius at Ostia, Fabiola in Rome, Chrysostom in Constantinople.[80] There was a hospital in Hippo, and another at Ephesus, in the early fifth century, which had over seventy beds in the poorhouse alone. Indeed, the impact of the hospitals was such that by the end of the fourth century a learned cleric, St. Nilus of Ancyra, could devote a

[70] Paul of Aegina, III.16, with Adams' commentary *ad loc.*: cf. also Luke, 8.27.

[71] Philostorgius, *Hist. eccl.* VIII.10; I am not entirely persuaded by Edelstein's arguments, *Ancient Medicine*, 219.

[72] Procopius, *Hist.* V.1.38.

[73] *Vita Aviti*, p. 181, calls him a deacon at Lyons; Avitus, *Ep.* 38; Ennodius, *Ep.* 384, calls him a doctor, cf. also *Epp.* 312, 437. The reference to his "Pontic rudeness," Ennodius, *Ep.* 445, may imply a visit to Constantinople, for he certainly knew Greek well, *ibid.* 384. Nevertheless, I think it unlikely that he is the Elpidius mentioned by Aeneas of Gaza, *Ep.* 19, as a well-known doctor at Gaza, *pace* L. M. Positano in her edition of Aeneas (Naples, 1950), *comm. ad loc.* On the bathhouse at Spoleto, Cassiodorus, *Var.* IV.24.

[74] *Vita S. Caesarii*, I.41.

[75] O. Böcher, *Christus Exorcista: Dämonismus und Taufe im Neuen Testament* (Stuttgart, 1972); A. J. Festugière, "Epidémies hippocratiques et épidémies démoniaques," *WSt*, 79 (1966), 157–64; together with the articles cited in nn. 66 and 69 above.

[76] H. Gertler, "Ärztliche Betrügereien im Rom der späten Kaiserzeit," in V. Beševliev and W. Seyfarth, *Die Rolle der Plebs im spätrömischen Reich* (Berlin, 1969), 77–80; contrast the wise words of A. D. Momigliano, "Popular Religious Beliefs and the Late Roman Historians," *Studies in Church History*, 8 (1972), 1–18.

[77] G. Harig, "Zum Problem 'Krankenhaus' in der Antike," *Klio*, 53 (1971), 179–95.

[78] S. W. Baron, *The Jewish Community* (Philadelphia, 1948), 91 f.; *id.*, *A Social and Religious History of the Jews*, 8 (New York, 1958), 239.

[79] A. Hug, in *RE*, 18.3, 1949, cols. 520–29, *s.v.* Pandokeion; *Inschr. Olympia* I.62; *Inschr. Priene* 111; *Inschr. Ilion* 3. Healing shrines, both pagan and Christian, can be considered a primitive form of hospital, in that they provided a form of medical assistance particularly for the poor, but long stays there are uncommon, and the amount of medical attention and treatment open to question.

[80] For Basil, see T. Miller, below, p. 54; for Eustathius, Epiphanius, *Haer.* III.1 (PG. 42.504), almost simultaneously with Basil, and possibly even earlier; Pammachius, Jerome, *Ep.* 66; Fabiola, Jerome, *Ep.* 77; Chrysostom, Palladius, *Dial.* (PG 47.20), cf. Chrysostom, *Ad Stag.* III.13 (PG 47, 490), cf. *id.*, *Hom. in Matt.* 56 (PG 58.630). Note also the emergency and temporary actions of St. Ephraim at Edessa during a plague c. 370, Sozomen, *Hist. eccl.* III.16.

long simile to detailing the various medical activities found within the hospital.[81]

That the hospitals in some way answered a need is obvious from the comments of their founders, and I wish only to raise two caveats. While Temkin is surely right to stress the importance of Christian hospitals as centers for medical advice and even for instruction, evidence for a recognizable teaching function in the hospital, which we know of in eighth- and ninth-century Islamic hospitals, is hard to find before eleventh-century Constantinople.[82] The Lives of Isaac the Protector and of Marathonius, which portray their heroes as leaving high society for menial tasks in a hospital, do not suggest a high degree of medical expertise or knowledge, even for the head of a hospital. But one should remember that in the Roman army, a man could equally move from being in charge of the camp hospital to being in charge of the military jail, and that administrative experience mattered perhaps more than acquaintance with Galen.[83] The introduction of formal teaching into the Byzantine hospital may thus owe much, if not all, to influence coming from the Arabs. Similarly, despite Dr. Miller's arguments,[84] material is still lacking that will enable us to judge whether the complexities of the Pantocrator hospital were the result of a natural development within the Byzantine hospital which in turn was adopted by the Arabs, or whether, as I think more likely, they were taken over from an Arabic tradition, perhaps itself deriving from Gondeshapur.[85]

My second point is a plea for help. The chronicle of Joshua the Stylite is our best ancient evidence for the effect of famine and plague on a local community, and it graphically describes how in the years around 500 Edessa was hit by a series of natural calamities. The reaction of the authorities was to set up more and more temporary hospitals, in the army camp, in the stoas, in the baths, to cope with the influx of patients from the town and its countryside.[86] An explanation purely in terms of filling a need is not enough to explain this change of attitude, which, within the space of a century, set the hospital in the front line of defence against illness. Medical historians need to look far more closely than they so far have at the sermons and literary texts about hospitals, and also at the various structural changes in society that may determine this new attitude.

One explanation may be that, after the chaos of the later third century, many of the former social and political ties, at both local and provincial level, had disappeared, and were replaced by a variety of different and overlapping systems of authority. In the West, we have the growth of big landed estates, with peasants being brought into almost fortified townlets. In the East, bishops like Gregory Thaumaturgus, Cyprian, or, later, St. Basil, take over some of the roles of the local aristocracy, for good or ill.[87] In the great Justinianic plague, St. Nicholas of Sion was suspected by the inhabitants of Myra in Lycia of engineering a food shortage in the town by banning the farmers from coming thither to market their produce. The local and provincial officials could not believe that this prudential decision was that of the farmers alone, and an unsuccessful attempt was made to arrest the saint.[88] We may be also getting a progressive fragmentation within the medical profession, between high and low class practitioners. The law codes indicate a growing power and influence for the court physician and his peers while the humbler local physician tries desperately to keep even the small privileges he has.[89] True, there is a constant tension between the financial needs of a community and a doctor's enjoyment of some degree of tax immunity at the community's expense, but the split between the court physicians, with their immense wealth and titles, and the lower men only adds to

[81] Augustine, *Serm.* 356.10; Ephesus, *Acta Conc. Oec.* II.1.405 (A.D. 451); Nilus, *Ep.* III.33 (PG 79.397).

[82] D. J. Constantelos, *Byzantine Philanthropy and Social Welfare* (New Brunswick, 1968), 152–84, gives a useful survey; Temkin, "Byzantine Medicine," 114 (= *The Double Face of Janus*, p. 220), but although there are doctors attached to hospitals, e.g., *CIG* 9256, I can find no secure evidence for formal teaching before the middle Byzantine period. A man like St. Sampson, *ActaSS*, June 27 (cf. PG, 115, 277–308), could have picked up his medical skills outside the hospital.

[83] John of Ephesus, *Lives* (PO 18.669); Sozomen, *Hist. eccl.* IV.27. For the careers of the (earlier) *optiones valetudinarii*, *ILS* 2117, 2437.

[84] In his article, "Byzantine Hospitals," in this volume.

[85] On the Pantokrator, see now P. Gautier, "Le typikon du Christ Sauveur Pantokrator," *REB*, 32 (1974), 1–145. On Islamic hospitals, a short introduction is S. Hamarneh, "Development of Hospitals in Islam," *JHM*, 17 (1962), 366–84.

[86] Joshua Stylite, *Chron.* XXVI, XXVIII, XLI–XLIII ed. Wright; cf. Sozomen, *Hist. eccl.* III.16; Hydatius, *Chron.* II.17–18.

[87] P. Brown, "The Rise and Function of the Holy Man in Late Antiquity," *JRS*, 61 (1971), 80–101; F. Millar, "Paul of Samosata, Zenobia and Aurelian: The Church, Local Culture and Political Allegiance in Third-Century Syria," *ibid.*, 1–17.

[88] *Vita Nicolai Sionitae*, ed. G. Anrich, *Hagios Nikolaos* (Leipzig, Berlin, 1913, 1917), I, p. 40; II, p. 243 f.

[89] *CTh* XIII.3; *CIC*, *CI* X.53; K. H. Below, *Der Arzt im römischen Recht* (Munich, 1953), 41–55; and the references in the next note.

this tension. The proud claim of Libanius, arguing on behalf of a civic doctor at Rhosus in Syria, that, though Philo himself is weak, the law is strong, rings somehow false against the implication of the law codes, that this law at least was eminently flexible.[90]

There are other indications of a growing, formal series of hierarchies among what was still an open profession which anyone might join. I merely note: the foundation of the Roman College of doctors in 368, the first example of self-selection for a medical elite, but which I would interpret less as a gesture of imperial philanthropy than as another attempt by Valentinian to reduce senatorial patronage;[91] the creation, both for Rome and for Constantinople, of a "count of the doctors" to take charge of all the doctors of the city;[92] and, the legal division of even *archiatri* into various grades of social eminence.[93] The result will be, as we learn from a letter of Theodore of Studion, a whole variety of different grades and statuses for the medical profession,[94] which may indeed correspond more closely to the realities of a practice of healing whose providers ranged from the local barmaid up to the doctor to the emperor.[95]

It would be wrong to conclude from this that late antiquity was in any way unusual. Recent studies of fourteenth-century France, sixteenth-century Norwich, and seventeenth-century Tuscany have alerted us to the possibility of the coexistence of a wide variety of healers, with different levels of expertise, wealth and status.[96] True, there is in late antiquity a general expectation that doctors will make money, even if they come from humble backgrounds, and patients were at times wary of offers of assistance from doctors whom they suspected of planning to fleece them.[97] True, we have several examples of really wealthy doctors: Pegasus of Laribus, who could ransom a governor's nephew for fifty *solidi*, about ten years' pay for a soldier,[98] or two chief doctors of Africa whose annual retainers were of seventy or ninety-nine *solidi*, which, in exceptional circumstances, might be topped up with fees and gifts to equal the income of a major bishop;[99] Phoebammon of Antinoopolis had an annual retainer from the hospital of sixty *solidi*, boats, vineyards and other pieces of property.[100] Doctors donated mosaics at Cartenna, Tralles, Furni and Mactar, and paid towards a church at Aphrodisias.[101] There were other local worthies: Alexander of Ephesus, whose statue stands proudly in the street of the Kouretes;[102] Dionysius, doctor, priest and philanthropist, captured and then released by the Goths;[103] not to mention Scantia Redempta, whose merits surpassed the capacity of men to record them, and who numbered among her activities the practice of medicine.[104] Below them, we have

[90] Libanius, *Ep.* 723, referring to Julian, *Ep.* 75b. On the relationship between this letter and *CTh* XIII.3.4., see J. Gothofredus, *Codex Theodosianus* (Lyon, 1665), V, p. 30; W. Ensslin, "Kaisar Julians Gesetzgebungswerk und Reichsverwaltung," *Klio*, 18 (1922), 147 f.; V. Nutton, "Archiatri and the Medical Profession in Antiquity," *PBSR*, 45 (1977), 147 f.

[91] *CTh* XIII.3.8, with my comments at "Archiatri," pp. 207–208, 217 f. It is worth stressing that the legal position of doctors in Rome before Valentinian was unique, and that there is no evidence for the creation of an exactly similar college, chosen from doctors by doctors, elsewhere in the Byzantine or Roman worlds. It may be significant that in the reconstituted *CIC*, *CI* XII.40.8, there is specific mention of the doctors at Rome, but not at Constantinople. It is unwise to posit on the evidence of a law directly relating to Rome that there must have been a replica of the college, founded and organized on exactly similar lines, at Constantinople, and, still more so, in cities elsewhere. Cf. also my article, "Continuity or Rediscovery? The City Physician in Classical Antiquity and Mediaeval Italy," in A. W. Russell, *The Town and State Physician in Europe* (Wolfenbüttel, 1981), 16–21.

[92] Cassiodorus, *Var.* VI, 19; but the title of Vindicianus as *comes archiatrorum* (in Marcellus, *De medicamentis*, ed. Liechtenham [*CML* V, 2nd ed.], I, p. 46), may imply a creation for Rome under Valentinian. L. Deubner, *Kosmas und Damian* (Leipzig, 1907), 160. Himerius, *Or.* 34.

[93] *CTh* VI.16 (= *CIC*, *CI* XII.13.1); XIII.3.17–19.

[94] Theodore Stud., *Ep.* II.162 (PG 99, 1907–09).

[95] For the barmaid-midwife, Eunapius, *Vit. phil.* 463; on the variety of types of practitioner, Hordern, "Saints and Doctors," 10 f., has sound things to say, against H. Evert-Kappesowa, "The Social Rank of a Physician in the Early Byzantine Empire," *Mélanges I. Dujčev* (Paris, 1980), 139–64, whose article is based on a limited number of sources and contains many errors of interpretation.

[96] D. Jacquart, *Le milieu médical en France du XII^e au XV^e siècle* (Geneva, 1981); M. Pelling, C. Webster, "Medical Practitioners," in C. Webster, *Health, Medicine and Mortality in the Sixteenth Century* (Cambridge, 1979), 165–235, extended in M. Pelling, "Tradition and Diversity: Medical Practice in Norwich, 1550–1640," in *Scienze, credenze occulte, livelli di cultura* (Florence, 1982), 159–71; C. M. Cipolla, *Public Health and the Medical Profession in the Renaissance* (Cambridge, 1976), 67–124.

[97] Libanius, *Epp.* 1018, 1523 (where the οὔπω is significant); Sozomen, *Hist. eccl.* III.16.

[98] Procopius, *Hist.*, IV.17.14.

[99] *CIC*, *CI* I.27.1.41. Three other doctors received retainers of fifty *solidi* a year. Professors and teachers at Carthage were to receive seventy *solidi*, lawyers from fifty to seventy-two. On the possibility of extra from fees, see the comments of S. L. Greenslade, *JThS*, n.s. 16 (1965), 222. A contemporary bishop of Anastasiopolis, a middle-ranking see, had an income of 365 *solidi* a year, *Vita Theodori Syk.* 78.

[100] P. Cairo Maspéro 67151, A.D. 570; Phoebammon was the son (and brother ?) of a civic physician.

[101] *CIL* VIII. 9633 (*ILChV* 614), of A.D. 357; H. Grégoire, *Recueil des inscriptions grecques chrétiennes d'Asie Mineure* (Brussels, 1922), n. 123; *CIL* VIII.25811 (*ILChV* 606b); *AEpigr*, 1952.49; Grégoire, *Recueil*, n. 272.

[102] Good photograph in *ÖJhBeibl*, 352 (1959), 363.

[103] *ILChV* 1233.

[104] *CIL* X.3980 (*ILS* 7805).

the wandering doctors: an Egyptian astrologer and doctor died at Ragusa in Sicily; another Egyptian after many journeys found his rest in Milan; a doctor from Claudiopolis in Asia Minor is buried at Verona; a Syrian, a Spaniard and two Gauls are recorded as *medici* in the Roman catacombs; and a Greek physician turns up in Spain at the end of the fourth century.[105] Nor can one say much about those doctors, both men and women, of whom nothing is known save their name, profession and place of burial, except that they existed, even in humble communities.[106] Poverty might even force a doctor to flee his responsibilities and disappear from the gaze of the taxman.[107] At the very bottom, there are the slaves, and here we have a serious problem. Excepting the παῖδες ἰατρῶν, who are far more likely to be apprentices, assistants, or even the doctors themselves than slaves,[108] I know of no text later than the third century which refers undisputedly to a slave or an ex-slave doctor, with the exception of two laws, of 530 and 531. These fix the maximum price for a slave doctor at sixty *solidi*, ten more than a secretary, and double the maximum for an unskilled slave.[109] Was Justinian legislating then for a nonexistent problem? Is this a piece of antiquarianism, like some of the laws reiterated later in the *Basilica*?[110] The numbers of such slaves may well have been very small, certainly by comparison with the first century A.D., yet the context of these laws suggests that such slaves did exist. The first law is eminently practical, setting the maximum price to be paid by an owner who wishes to manumit a slave held in common, and here Justinian expressly imposes a solution upon an old and much discussed question. The second again deals with the price to be paid to co-owners, in this case for a slave left as a joint legacy, whom one owner wishes to purchase entirely for himself. Although the numbers of such disputed slaves cannot be known, and it may be doubted whether they were high even in the days of slave doctors in the first century, the law and Justinian's decision do suggest that they existed and had not disappeared entirely from the social scene.

The evidence I have put forward hardly permits firm conclusions about the status, or even about the practice, of medicine in late antiquity.[111] At best one can point to long-term trends, or to areas which seem worthy of further investigation, and this essay has aimed to sketch possible developments rather than establish unshakable conclusions. Yet there is one final impression that can be set forward, if only briefly. Compared with the first three centuries of the Roman Empire, the doctor in late antiquity has a much greater public profile beyond the confines of his city and civic life. He becomes a bishop, a church leader, even a saint; an ambassador, a provincial governor, even the Master of Offices.[112] Although I do not believe in the ancient tradition that associated the founding of the great medical school of Gondeshapur (Iran) with Greek physicians sent by the Emperor Aurelian in 271 or 272 to accompany his daughter to the Sassanian

[105] *Epigraphica*, 12 (1950), 99 (= S. L. Agnello, *Silloge di iscrizioni paleocristiane della Sicilia* [Rome, 1953], n. 68); *Epigraphica*, 10 (1948), 62 f., with the corrections of W. Peek, *ibid.*, 12 (1950), 27 f.; *IG* XIV. 2310a; *CIG* 9777; *CIL* VI.9597; *CIG* 9578; *AE* 1939, 162; *Vitae SS. Patr. Emeritensium*, ed. Garvin, IV.11.

[106] E.g., *MAMA*, III.167, 409, 528b, 617; VII.233: VIII.118; *RBibl.* (1905), 248; *Sammelbuch* 7316, 7488, 7491, 7493; *BCH*, (1880), 199; *Inscr. Syria* 1528; J. Jalabert, *Mél. fac. or. Beyrouth* (1906), 146; V. Beševliev, *Spätgriechische Inschriften* 98, cf. 184a; *CIG* 9209, 9669, 9792, 9977; *Epigraphica*, 6 (1944), 6; *ICVR* 1041, 5695; *ILChV* 255, 607, 608, 609, 613; *IG* XIV.604, 1529, 2406; *PBSR*, 37 (1969), 97 f.; G. Lefebvre, *Receuil des inscriptions grecques chrétiennes d'Egypte*, nos. 4, 496, 799. This list is not complete, and I have not listed clerics who are also physicians, e.g., *Inschr. Erythrae* 142.

[107] C. Wessely, *Stud. Pal.* 20.129 (A.D. 497), cf. Libanius, *Ep.* 756.

[108] Although, as Professor Renehan has shown, *Greek Lexicographical Notes* (Göttingen, 1975), 156 f., the phrase is regularly used as a circumlocution for "doctors," e.g., PG 59.137; 62.437; Aeneas Gaz., *Ep.* 20; *Suda*, *s.* ἀποπληξία, it can have a more specific use, e.g., Aristides, *Or.* 39.14; Julius Africanus, 20 Vieillefond; Origen, *Entretiens avec Héraclide* (P. Fouad), p. 162; Epiphanius, *Haer.* 51.1.

[109] *CIC*, *CI* VI.43.3.1; VII.7.1.5a; Below, *Der Arzt*, 9–11.

[110] H. J. Scheltema, *CMH*, IV.2 (Cambridge, 1967), 66 f.

[111] I remain sceptical about almost all attempts to define the status of doctors in antiquity, since, for the most part, they are based on a few scattered pieces of literary evidence. In the absence of quantitative records, such as the sixteenth-century taxation lists, reliance on qualitative sources—i.e. comments by doctors, poets, historians—is essential. But great caution is necessary, and few of the essays at delineation have covered more than a fraction of the existing sources, or made satisfactory comparisons between medical and other similar groups like those of the *professores* and *grammatici*. The evidence of epigraphy has been largely neglected, and the criterion of judgment adopted has all too often been dependent on an anachronistic definition of who a doctor was. On the problems of interpretation, see my forthcoming article, "Verso una storia soziale della medicina antica," and "Murders and Miracle Cures: Lay Views of Medicine in Classical Antiquity," in R. S. Porter (ed.), *The Patient's View* (Cambridge, 1985).

[112] Respectively, Basil of Ancyra, Jerome, *Vir. ill.*, 89; Hieracas the heretic, Epiphanius, *Haer.* 67; St. Caesarius, Gregory Naz., *Or.* VII.; Maruthas of Martyrpolis, Socrates, *Hist. eccl.*, VII.8, with J. S. Assemani, *BO*, 1725, III.1.73; Vindicianus, Augustine, *Conf.*, IV.3, cf. *id.*, *Ep.* 138; Theoctistus, Zacharias Schol., *Chron.*, V.1; V.4, cf. Photius, *Bibl.*, cod. 220. W. A. Fitzgerald, "Medical Men, Canonized Saints," *BHM*, 22 (1948), 635–46, is a useful, if somewhat uncritical, listing.

court,[113] there can be no doubt of the significance of medical men in late antiquity as envoys and mediators between Byzantium and Persia.[114] They appear in political negotiations between emperors, or between city and emperor, and the machinations of Joseph, doctor, politician and Catholicos of Seleucia, were notorious on both sides of the political frontier.[115]

Even a translator, Sergius of Resaena, turns out to have had a more than minor role to play in ecclesiastical diplomacy. Born at Antioch, he studied medicine at Alexandria before becoming civic physician at Resaena, on the Syrian frontier.[116] It cannot be excluded that he spent some time also at the Persian court, for Agathias mentions a Sergius who translated into Greek a history of the kings of Persia.[117] He was probably also a deacon, a friend of the great Patriarch of Antioch, Severus, and sufficiently acquainted with theological writers like Origen and Dionysius the Areopagite to compose his own tract on "Faith."[118] He was also a distinguished translator, mainly of medical and philosophical writings, and it was largely through his versions that the Syriac and, indirectly, the Arab physicians derived their acquaintance with Galenic medicine.[119] Denunciations of him as "lustful after women, incontinent and greedy for money" or "a eunuch, corrupt and immoral" are perhaps to be treated less as fact than as the judgment of his opponents on his theological maneuvers.[120] In 535, having fallen out with Asylus, bishop of Resaena, he visited Ephraem, Patriarch of Antioch, to complain of his ill-treatment. Ephraem, concerned at the rising tide of Monophysitism, sent Sergius to Rome with a letter for Pope Agapetus, accompanied by a young architect from Amida, Eustathius. He was cordially received in Rome. But, on a second mission in 536 to the Patriarch of Constantinople, he was struck down with an unmentionable disease and died there in what his opponents regarded as deserved agony.[121]

Doctors are undeniably prominent in political and ecclesiastical negotiations in the fifth and sixth centuries, and it would be tempting to ascribe this feature to either a growth in the importance of physicians, or, with perhaps greater plausibility, to their abilities as bilingual (or even multilingual) men of culture, able to cross political frontiers and yet communicate in a shared language, usually Syriac. But court doctors have always been prominent or suspected of having a hand in political and dynastic dealings, and travels of physicians between the Greek world and the courts of the Near East had been known since the time of Democedes and Ctesias.[122] The increased profile of the physician may perhaps be due as much to the bias of the sources—which reveal far more information about diplomacy than a Livy, a Tacitus or an Appian—as to any sudden rise of physicians as a class to historical eminence.

This survey ends tentatively, and with good reason, for much work still remains to be done before a proper history of medicine and medical ideas in late antiquity can be written. Yet, despite its essentially preliminary nature, it points to a series of truths that not all medical historians have been willing to believe. There is, for the period of late antiquity, a great variety of evidence, in both quantity and quality, which deserves study in its own right

[113] The tradition, which is found in Arabic and Syriac authors, e.g., Barhebraeus, *Chron*, p. 56 Budge, is accepted by C. Elgood, *A Medical History of Persia*, (rev. ed. Amsterdam, 1979), 46, and, with varying degrees of scepticism about the influence of the school before the sixth century, by A. Siassi, "L'Université de Gond-i Shāpūr," *Mélanges H. Massé* (Teheran, 1963), 366–74; F. R. Hau, "Gondeschapur—eine Medizinschule aus dem 6. Jahrhundert n. Chr.," *Gesnerus*, 36 (1979), 99; H. H. Schöffler, *Die Akademie von Gondischapur* (Stuttgart, 1979), 29 f. The serious weakness of this late tradition is easily demonstrated: according to the Roman sources, the emperor Aurelian had no daughter, cf. *Vita Aureliani* 42. In its place I would set a gradual accretion of medical learning across a political, though, significantly, not a cultural or linguistic, frontier over several centuries.

[114] I have not yet seen the article by R. C. Blockley, in *Florilegium*, 2 (referred to by Professor Baldwin, below, p. 17). The importance of doctors as ambassadors is acknowledged both by Greek historians, like Procopius and Menander, and by writers of Syriac chronicles. See, e.g., J. B. Chabot, "Synodicon Orientale," *Notices et extraits*, 37 (1902), 352, n. 1; *Chron. of Sirt*, PO, 7, pp. 136, 148, 161, 524. For the importance to a city of its doctor, Procopius, *Hist.*, XXVI.31 f. Cf. also N. M. Garsoian, "Le role de l'hiérarchie chrétienne dans les relations diplomatiques entre Byzance et les Sassanides," *REArm*, n. s. 10 (1974), 119–38. A J. Butler, *The Arab Conquest of Egypt*, 2nd ed. (Oxford, 1978), 135.

[115] Zach. Schol., *Chron.* XII.7; *Chron. of Sirt*, PO, 7, pp. 176–81 (cf. p. 192, for another court doctor meddling in high ecclesiastical politics); Assemani, *BO*, III.1.433.

[116] Zach. Schol., *Chron.* VII.10.

[117] Agathias, *Hist.* IV.30, but this may be another Sergius.

[118] Severus, *Epp.*, PO, XII.2, nos. 31, 85, 86; C. Brockelmann, *Geschichte der christlichen Literatur des Orients* (Leipzig, 1907), 42.

[119] R. Degen, "Galen im syrischen," in Nutton, ed., *Galen, Problems*, 131–66.

[120] Zach. Schol., *Chron.* VII.10; Barhebraeus, *Hist. Patr.*, ed. Assemani, *BO*, II, p. 323. The Jacobite chronicle of 724 is a little milder, tr. J. B. Chabot, CSCO, *Script. Syr.*, ser. 3, IV.170.

[121] *Ibid.*

[122] Democedes, Herodotus, *Hist.* III.129–37; Ctesias, *FGrHist* (repr. Leyden, 1954), no. 688. For even earlier movement of "palace doctors," cf. E. Edel, *Ägyptische Ärzte und ägyptische Medizin am hethitischen Königshof* (Opladen, 1976).

and not just for its part in the transmission of Galenic ideas from the second century to the Arabs and the Renaissance. It reveals a medical world somewhat different from the static and forbidding picture painted by Bloch and even A. H. M. Jones—with new problems, and with new solutions. It represents a challenge to the historian, yet its rewards are substantial. Later essays in this volume will exemplify how much can be learned from even small sectors of a vast field, which still awaits its harvesters. The brevity of this exposition can thus be justified in the words of a late Alexandrian commentator on *Epidemics VI*, for, like Hippocrates, I am sowing the seed, and my selection of topics has been deliberately restricted in order to encourage others to use their judgment and their own powers of discovery.[123]

The Wellcome Institute for the
History of Medicine, London

[123] Palladius, *In Epid. VI scholia* (p. 157 Dietz).

ASPECTS OF BYZANTINE MATERIA MEDICA*

JERRY STANNARD

Byzantine materia medica, although not coterminous with Byzantine medicine in general, was certainly one of its more prominent subdivisions. Many different kinds of texts, varying greatly in size, date, style and credibility were concerned, wholly or partially, with medicaments as the primary means of promoting health. The heterogeneous nature of those texts is such that some have been ignored by students of Byzantine medicine while others would scarcely be recognized as practical medical texts by physicians and pharmacists today. For that reason, it may be convenient to examine some of the major components of Byzantine materia medica and to determine their relations, one with another, within the wider context of Byzantine medicine.

Prior to our discussion of some of the characteristic features of Byzantine materia medica, a few remarks on sources and their utilization are required. These remarks, however, are not those of the *Quellenforscher*, bent on establishing a textual tradition or the reconstruction of a lost *Urtext*. Rather, they are designed to call attention to one of the most pervasive characteristics of Byzantine materia medica, viz., the reliance of Byzantine writers on earlier written sources and the frequency with which the same authorities and their claims were copied, recopied, paraphrased and excerpted century after century.[1]

In Byzantine texts on materia medica a reference to a written source, especially in the form of a personal name, for example, Hippocrates or Galen, was not the act of historical scholarship that today is associated with a learned footnote. Such a reference, it is true, sometimes furnishes a useful clue to the sources used by late Byzantine writers. But sometimes it appears as if a citation to an earlier writer was a ritualistic performance reflecting, in part, the traditionalism inherent in Byzantine medicine.

Hippocrates and Homer, as one would expect, were almost venerated by medical writers and, in the case of Hippocrates, for good reason. Leaving aside the question concerning the authorship of the texts traditionally ascribed to Hippocrates, there is little doubt that the observations contained in some of those texts provided valuable insights into the nature of disease and hence guidelines for therapy. On the other hand, citing the equally magical name of Homer was of questionable value with respect to therapeutic practice. For similar reasons references to Orpheus, Democritus, Poseidonius, and others were more a show of learning than an indication of how to minister to the sick.

References to the earlier, well-known Greek and Greco-Roman physicians are more readily understood. This applies especially to Dioscorides and Galen, but to others as well. Some of their writings, not merely extracts available in a florilegium, must have been readily available for consultation judging by the frequency of citation and the fidelity with which those passages agree with the original.[2] Even earlier Byzantine medical writers are sometimes cited by their successors, for example, Oribasius, Theophilus, Aitios, John Myrepsus and Jacob Psychrestus are all mentioned, favorably one might add, by later compilers.

In addition to citing sources and authorities by name, there are also references to anonymous oral

[The reader is referred to the list of abbreviations at the end of the volume.]

*I am grateful to Miss Mary Kay, Head, Reference Department, University of Kansas Libraries, and her staff for assistance in obtaining some of the materials necessary for the completion of this study.

[1] As an example, see the parallel passages assembled by A. Sideras, "Aetius und Oribasius," *BZ*, 67 (1974), 110–30.

[2] See J. M. Riddle, "Pseudo-Dioscorides' *Ex herbis femininis* and Early Medieval Medical Botany," *JHB*, 14 (1981), 43–81.

sources,[3] rustics,[4] books whose titles can no longer be ascertained,[5] and the vague references to *hoi Indoi, hoi Persai, hoi palaioi*, and the like. Finally there is a large but elusive class of references, typified by such phrases as *hos tines phasi* and *hos legetai*. Whether the passages introduced by such phrases are genuine references to information current at the time or mere literary formulae requires further research.

Last is a group of pseudonymous texts. The attribution of a text, often rather small, to an identifiable figure was a well known literary device in both the East and the West. Hence there are several texts on materia medica that were attributed to Hippocrates, Galen, Dioscorides, Aitios, Simeon Seth and others.[6] None of these is now accepted as genuine.[7]

It is important, then, to recognize the dependence of Byzantine writers upon their predecessors. This applies particularly to descriptions of plants and plant substances which, in fact, make up the bulk of the composita. As the writings of Aitios and Paul indicate, they often repeated, sometimes with only the slightest verbal modifications, descriptions of simplicia drawn from Galen's abridgments of Dioscorides or from the latter's *De materia medica*.[8] There is little evidence in such descriptions that the Byzantine compilers possessed any additional information, with the result that the contemporary reader of Aitios or Paul was reading an account already over 500 years old. While plant species do not normally change very much in so short a period, their geographical distribution, and hence market availability, may have changed dramatically. Silphium is a good example.[9] According to Pliny the Elder, it was already rare in the first century A.D.[10] Yet Leon and Alexander include it as an ingredient in composita without any hint that it might be rare or even unprocurable.[11]

With this by way of background, it is time to examine five other prominent aspects of Byzantine materia medica.

A convenient starting point is the recipe literature. For this is, in terms of size, one of the largest single components of the literature on materia medica.[12] By that very fact, it reveals the attitude towards drugs and the reliance placed upon them.[13]

I. Recipes

Recipes played the same role in Byzantine medicine as they do in modern folk medicine.[14] They were, so to speak, the distillate of traditional wisdom. They were the tangible evidence that diseases and other complaints were capable of being cured, for, after all, what other meaning can be placed on such phrases, usually at the conclusion of a recipe, as: "this has been tried," "he will be cured," or "you will be amazed." Other phrases of similar intent perhaps exaggerated the efficacy of the remedy.

The sheer mass of recipes, whether or not accompanied by magical devices,[15] gave the impres-

[3] ἐγώ γοῦν οἶδά τινα, ὃς . . . ἔφασκε Alexander (ed. Puschmann), II, 485.

[4] Alexander identified his sources for useful medical information as παρ' ἀγροίκου (II, 563 Puschm.) and παρὰ Κερκυραίου ἀγεοίκου (II, 565 Puschm.) Dialectal forms of plant names are likewise credited παρὰ τοῖς ἰδιώταις (Delatte, *Anecdota*, II, 283.13; 300.14; cf. also 345.12 . . . οἱ ἰδιῶται καλοῦσι).

[5] The source for the Mousarion collyrium is described by Alexander (II, 15 Puschm.) ἐκ τοῦ ἱερατικοῦ τόμου.

[6] As an example of such pseudonymous texts, see H. Schöne, ed., "Hippokrates Π. φαρμακῶν," *RhM*, 73 (1920), 434–48.

[7] See Delatte, *Anecdota*, II, pp. 339, 385, 456, 466.

[8] *De simplicium medicamentorum temperamentis ac facultatibus*, in Galen (ed. Kühn), XI, 379–892; XII, 1–377.

[9] Asafoetida, the congealed sap of silphium, was also known under other names, for example, λάσαρον καὶ λάσαρ ὁ ὀπὸς τοῦ σιλφίου, Delatte, *Anecdota*, II, 290.7. It was probably obtained from one or both of two closely related species, *Ferula narthex* Boiss. and *Scorodosma foetidum* Bunge. See, Vladimir Vikentiev, "Le Silphium," *BIE*, 37 (1954), 123–50.

[10] *NH* 19.15.39.

[11] Leon Philosophus, *Conspectus medicinae* I, 8 (in Ermerins, p. 97); Alexander, I, 407 Puschm.

[12] E. Jeanselme, "Sels médicamenteux et aromatiques," *BullSocFrançHistMédical*, 16 (1922), 324–34; *id.*, "Sur un aide-mémoire de thérapeutique byzantine," *Mél. Ch. Diehl*, I (Paris, 1930), 147–70; A. P. Kousis, "Quelques considérations sur les traductions en grec des oeuvres médicales . . . par Constantin Melitiniotis," Πρακτ.Ἀκαδ.Ἀθ., 14 (1939), 205–20; *id.*, Ἐκ τῶν Μητροδώρας περὶ τῶν γυναικείων παθῶν τῆς μήτρας, Πρακτ. Ἀκαδ.Ἀθ., 20 (1945), 46–68; Emile Legrand, "Formulaire Médical de Jean Staphidas," in his *Bibliothèque Grecque Vulgaire*, II (Paris, 1881), 1–27. Miscellaneous recipes are noted in Ch. Daremberg, "Notices et extraits des manuscrits médicaux grecs," *AMSL*, 2 (1851), 24–37. Because of a Byzantine substratum in late Coptic *Rezeptliteratur*, cf. Walter Till, "Koptische Rezepte," *BSACopt*, 12 (1949), 43–54 and *id.*, *Die Arzneikunde der Kopten* (Berlin, 1951). For Western medieval analogues, cf. J. Stannard, "Rezeptliteratur als Fachliteratur," *Scripta* (Brussels), 6 (1982), 59–73.

[13] For useful supplementary references to the use of and value placed upon drugs and drug therapy at the popular level, see J. H. Magoulias, "The Lives of the Saints as Sources of Data for the History of Byzantine Medicine in the Sixth and Seventh Centuries," *BZ*, 57 (1964), 127–50.

[14] J. Stannard, "Albertus Magnus and Medieval Herbalism," in James Weisheipl, ed., *Albertus Magnus and the Sciences* (Toronto, 1980) 355–77.

[15] Cf. the series of "Recettes magiques" edited by A. Delatte, *Anecdota*, I, *passim*.

sion that, provided the enumerated ingredients were available, prepared and administered in the manner stipulated, there was, ready at hand, one or more means of combating a disease. The plurality of recipes for the same complaint, often in succession, seemed to demonstrate that there was a variety of procedures, all equally efficacious. The conclusion that *we* would reach, viz. that such a sequence was a virtual admission that none was predictably reliable, was apparently not drawn. The usefulness of these recipes, however, was not confined to curing diseases or healing wounds. They also provided one with the means of averting misfortunes, prognosticating the future, and a wide range of techniques applicable to daily life, either at home or when traveling abroad.[16]

Because of the wide range of processes and events that could be corrected or controlled by following a recipe, it is impossible to even guess at their number. They occur in profusion, as one might expect, in the general medical treatises, from Oribasius to Actuarios. In addition they occur, though with a lesser frequency, in lexica, herbals, and dietetic texts. Finally, of course, there were the recipe collections themselves. But even here, there is considerable variety in the individual recipes. Many were straightforward statements of what to prepare and how to administer it for a specific medical problem, for example, gout, fever, headache, and the like. Others, however, were more akin to what we would call *secreta*, that is, pieces of useful information, not generally known, relating to the solution of mundane problems, for example, how to rid the house of mice,[17] how to disguise gray hair,[18] or the means of exorcising demons[19] or predicting the sex of an unborn child.[20]

II. Lexical

A second aspect of Byzantine materia medica, prominent in itself but also related to the authoritarianism noted earlier, is a concern with nomenclature and other lexicographical issues.[21] That concern with words was not restricted, however, to glossaries, many of which have been published in the past half century.[22] The same attention to orthography, etymology, and synonymies is also evident in the recipe literature and in the descriptions of simplicia that are scattered throughout the several medical texts.

A concern with words might appear, at first glance, somewhat sterile from a medical point of view. But, despite the inevitable excesses of some authors, such a concern was meant to serve a practical purpose. To what extent it did so, however, is difficult to judge in the absence of evidence concerning the use of those lexica by physicians and apothecaries in the course of their daily professional work.[23] But the time and effort expended in preparing lexica, especially the multilingual ones, was probably justified.

Classical, that is, Attic Greek, the *koine*, and some vernacular dialects came together in Byzantium. Over the centuries that polyglot was infiltrated by many non-Greek loan words, some of which were later accepted and functioned as if they were truly Greek.[24]

As a result of this linguistic admixture, various problems arose concerning the vocabulary of materia medica. As older words lost currency and were

[16] In addition to Delatte, *Anecdota*, II (cf. note 4 above), see H. J. Magoulias, "The Lives of Byzantine Saints as Sources of Data for the History of Magic in the Sixth and Seventh Centuries A.D.," *Byzantion*, 37 (1968), 228–69. Means of averting the potential dangers of traveling are indicated in numerous ways. For example, see G. Dagron et J. Rougé, "Trois horoscopes de voyages en mer," *REB*, 40 (1982), 117–33.

[17] Margaret H. Thomson, ed., *Textes grecs inédits relatifs aux plantes* (Paris, 1955), p. 111.9–19.

[18] Kousis, "Quelques considérations" (note 12 above), 213.1–4. Three recipes for darkening the hair are given by Alexander, I, 453 Puschm.

[19] Sp. Kabasilas, Λαογραφικὰ σύλλεκτα, Λαογραφία, 2 (1911), 645–54; Delatte, *Anecdota*, I, 111.1–18. For a modern parallel, cf. L. Arnaud, "La baskania ou le mauvais oeil chez les grecs modernes. II. Exorcismes quérisseurs," *EO*, 15 (1912), 518.

[20] E. Legrand, *Bibliothèque* (note 12 above), II (1881), 16.452–55; A. Delatte, *Anecdota*, I, 451.19–22.

[21] Cf. J. Stannard, "Byzantine Botantical Lexicography," *Episteme*, 5 (1971), 168–87.

[22] A. Delatte, "Le Lexique de botanique du Parisinus graecus 2419," *BiblFacPhilosLettLiège*, 44 (1930), 59–101; *id.*, *Anecdota*, II, 273–454 [15 lexica]; Margaret H. Thomson, *Textes grecs* (note 17 above), 125–77 [3 lexica]. Much earlier, Vilh. Lundström published two other lexica: "Botaniska lexika från den grekiska medeltiden," *Göteborgs Högskolas Årsskrift*, 15 (1909), 42–52; *id.*, "Ett persiskt-grekiskt medico-botaniskt lexikonfragment," *Eranos*, 12 (1912), 170–74.

[23] It is tempting to think that the ἐπιστήκων or the πημεντάριοι attached to the Pantokrator Hospital had access to a receptarium in order to prepare the many different compounds for patients of both sexes who suffered from a variety of illnesses and wounds. Cf. P. Gautier, ed., "Le typikon du Christ sauveur Pantocrator," *REB*, 32 (1974), 1–145.

[24] For example, ζουλάπιον (Arab. *julab*), used by Planudes, *De morborum materie*, 30 (Ideler, II, p. 321.9). For similar reasons, μαατζοῦν (Arab. *matzun*) i.e., an electuary, "encore usitée aujourd'hui chez le peuple grec," A. Kousis, "Quelques considérations" (note 12 above), p. 217. Cf. also πημεντάριος (Lat. *pigmentarius*, note 23 above. For further examples, see G. Meyer, "Die lateinischen Lehnworte im Neugriechischen," *SBWien*, Phil.-hist. K., 132/3 (1895), 1–84.

supplemented, then supplanted, by newer words, lexica were required in order to stay abreast of medical terminology, and, at the same time, to read with understanding the older authorities, especially Dioscorides and Galen.

The perplexity created by the fluid vocabulary of materia medica can be illustrated in many ways—for example, the profusion of synonyms, Greek and non-Greek alike,[25] for a single substance, scribal errors based on similarities of sound and/or spelling of words denoting medical substances, and the fact that, even today, the denotata of some of those terms is an educated guess.[26]

The ambiguity that resulted was not a mere academic challenge, for it may well have made a difference whether, for example, *ammoniakon* was thought to mean a mineral or a gum resin,[27] or whether *peristereon* meant a bird or a plant,[28] or *chelidonion* a bird, a mineral *or* a plant.[29]

Under these circumstances and in the absence of a standardized nomenclature, many physicians prepared lexica for their private use. These must be distinguished from the lexica prepared by literary scholars and professional glossators such as Photios and Hesychios. For while the former are grossly inferior in terms of style, and all of them much smaller, they have the merit of being restricted, for the most part, to the vocabulary of medicine and allied disciplines. This should not be taken to mean, however, any significant advance in medical lexicography. For, despite the praiseworthy purpose for which these smaller lexica were compiled, they are studded with errors of one kind or another. The most important, for our purpose—and I think I also speak for the nameless patients of those physicians—is the high number of incorrect synonyms for plants, portions of which served as ingredients in literally hundreds of composita. It would be uncharitable to catalogue those incorrect synonyms here, but it is worth emphasizing if only to call attention to the possibility of serious consequences when the names of medicinal substances were misunderstood.

III. Medicinal Substances

It is but a short step from the words used to denote medicinal substances to an examination of the substances themselves. The vast majority described in Byzantine texts on materia medica as having therapeutic properties can be identified with some assurance.[30] Of that number many are also known today, though not always as medicinal substances. Some of them, garlic and parsley for example, are used as seasoning agents. Others, for example thyme and rue, are grown in modern herb gardens, while others, such as the lily or daffodil, are known as ornamentals. Still others, such as frankincense and myrrh, are used for liturgical purposes much as they were in Byzantium. Finally, of course, many of the substances listed as ingredients in Byzantine recipes are still employed as primary foodstuffs: tuna, goose, wheat and barley, cheese, bread, and wine. Moreover, nearly every one of the substances mentioned in our texts is also used in modern folk medicine, and often for similar purposes. Most of the substances found in Byzantine materia medica, however, have long since been abandoned in modern *Schulmedizin*.

For a variety of reasons—uncertainty concerning the precise identification of some substances, the ambiguities of the lexical synonymies and, above all, the absence in antiquity of any chemical means of describing mineral substances—it is idle to speculate on the number of therapeutic substances referred to in our texts. But even if certainty were reached concerning their identification, it is un-

[25] Three of the lexica edited by Delatte (*Anecdota*, II, pp. 393–454) contain synonyms in Latin, Italian, Turkish and Arabic.

[26] A selection of neologisms and rare words pertaining to Byzantine materia medica will be found in Jeanselme, "Un aide-memoire" (note 12 above), *passim*.

[27] 'Αμμωνιακόν was a gum resin derived from *Dorema ammoniacum* D. Don. Used medicinally for its pungent odor, the fumes were inhaled; hence the frequent gloss θυμίαμα. Ἅλς ἀμμωνιακός, known to Byzantine glossators as ἅλας ἀμμωνιακόν, was a natural, crystalline, mineral substance whose composition probably varied depending upon the water-soluble impurities. Because the two substances were not always distinguished, a post-classical name, λεοντόγαλα, was coined (Delatte, *Anecdota*, II, 306.12).

[28] Περιστερεών, sometimes περιστερά in the lexica, usually meant a plant, probably *Verbena* sp., hence the synonymy ἱερὰ βοτάνη. The form περιστερεὼν ὄρθιος or ὀρθός was presumably an attempt to distinguish the plant from the common dove. The latter occurs rarely as a medicament and not at all in the medical lexica. Dioscorides' effort to explain the name (IV, 59 Wellmann) was abbreviated by Galen, XII, 98 K. For further details, cf. J. Stannard, "Magiferous Plants and Magic in Medieval Materia Medica," *Maryland Historian*, 8 (1977), 33–46.

[29] Due to the similarity between χελιδών, χελιδόνιον and χελιδονία these terms became confused, as they had in Latin. In fact, the confusion in late Greek reflects the Latin, cf. χελιδόνιον τὸ μικρόν· κελιδώνια μηνόρε and χ. τὸ μέγα· κ. μαϊόρε, Delatte, *Anecdota*, II, 416.16–17.

[30] Cf. B. Langkavel, *Botanik der späteren Griechen vom dritten bis driezehnten Jahrhunterte* (Berlin, 1866). (Langkavel's study must be used with caution). For supplementary data and modern scientific nomenclature, cf. J. Stannard, "Identification of the Plants Described by Albertus Magnus, *De vegetabilibus*, Lib. VI," *Res Publica Litterarum*, 2 (1979), 281–318.

likely that all of them would have been available at any one time in a given place.

It is more compendious, therefore, to divide the medicinal substances into five large groups and provide a few illustrations of each.

(i) Substances of Plant Origin

Since several examples of plant substances that were used therapeutically have been noted above, it will suffice to make but a few general observations. Approximately 450 different species of plants can be identified in the materia medica. This includes all the major taxa, including mosses, ferns, algae and even fungi. The greatest emphasis, however, was on the seed-bearing plants whose seeds, foliage and roots accounted for most of the botanicals whether used as medicaments, as seasoning agents, or as primary foods. In many instances it appears that a pronounced aroma or taste was the most important rationale for its use, unless, of course, the older authorities could be cited as having used that species for a specific purpose. But it was the exotica, transshipped via the Near East, that dominated the recipes—cinnamon, pepper, ginger, cloves and sugar. These, the so-called spices, were usually available only in the dried commercial form. Various passages suggest that their quality varied considerably. This may have been due to political and economic events which periodically disrupted trade. Despite the efforts of the commercial guilds, uniform quality was probably not always achieved.

(ii) Substances of Animal Origin

As in the case of plants, some portion of most of the common animals—sheep, goat, ass, for example—was used for some medicinal purposes. This included not only mammals but birds, fish, reptiles and amphibia. But the use of animal products extended well beyond the vertebrata. A wide range of insects, arachnids, crustacea, molluscs, and other phyla were also employed.[31] By and large, most of the animal substances long ago disappeared from medical practice, and one suspects that part of the reason for this was that while it may have been difficult to authenticate, it was all too easy to falsify crocodile dung, hyena gall, rabbit brain, and the like.

(iii) Substances of Mineral Origin

It is even more difficult to summarize the therapeutic uses of mineral substances for, in many cases, their descriptions permit only a tentative identification. Depending upon the impurities, inorganic as well as organic, plus physical processes such as weathering, what passed for *nitron* or *adarke* in one region may have been quite different with respect to color, odor, texture and weight in another region.[32] It was their physical properties and physiological action that determined the medicinal uses, particularly the water-insoluable minerals and metallic ores. Nonetheless, one can specify a few of the more frequently used mineral substances. Leaving aside coral and amber, whose animal and plant origin respectively were apparently unknown, this includes sulfur, various iron, lead, copper and arsenic compounds, argillaceous clays, and a host of precious and semi-precious gem stones whose virtues were enumerated in lapidaries.[33]

(iv) Praeparata

The fourth class, praeparata, can be dismissed more quickly, but not because those substances were unimportant. It is rather the case that the items falling within this class—wine, vinegar, olive oil, butter, barley meal, cheese, bread and the like—were, and are, household items known to all.[34] Each of the aforementioned was used for therapeutic purposes, either singly or as an ingredient in composita. To some of them specific properties were attributed. Butter, for example, possessed, according to Paul, a digestive and a dispersive or discutient property. For that reason it was useful for buboes and other swellings.[35]

(v) Composita

The last class, composita, can be dealt with even more quickly, for there is no simple way of discussing several hundred compound drugs in one paragraph. Suffice it to say our texts provide accounts

[31] J. Théodoridès, "Intérêt scientifique des miniatures zoologiques d'un manuscrit byzantin," *Acta Biologica Debrecina*, 7/8 (1969–70), 265–72, 8 figs.

[32] Cf. M. Japhet, "Etude sur les principales eaux minérales de l'Asie mineur," *AnnSocHydrolClimatolMéd de Paris*, 23 (1877–78), 316–80.

[33] Cf. M. Psellos, *De lapidibus*, in Ideler, I, 244–47. (The recent edition by P. Galiani, *Michele Psello, De lapidum virtutibus* [Firenze, 1979] was not available to me.) Extracts from the Ps.-Hippocratic Ἑρμηνεία περὶ ἐνεργῶν λιθῶν are printed by Legrand, *Bibliothèque*, II, (1881), p. xxiii.

[34] E. Jeanselme et L. Oeconomos, "Aliments et recettes culinaires des Byzantins," *ProcInternCongrHistMed, London, 1922*, (Anvers, 1923), 155–68.

[35] Paul (ed. Heiberg [*CMG* IX, 1] I, p. 201).

of how to prepare and administer them, possible modifications, admissible substitutions, and the purpose or purposes served by each. Not infrequently this is accompanied by remarks concerning dosage and potential side effects. Many of those composita, incidentally, bore specific names, for example the Collyrium of Constantine or the Salt of St. Gregory the Theologian.[36] This association of a drug with the name of the person who allegedly introduced it or used it with conspicuous success was a convenient tag for physician and patient alike and acted occasionally, no doubt, as a testimonial.

IV. Dietetics

The fourth aspect concerns dietetics. Throughout antiquity and the Middle Ages, there was an intimate relation between materia medica and dietetics. This was due partially to the dangers inherent in one of the most obvious of alternatives to drug therapy, surgery. Emphasis was thus often placed on the adoption of a regimen, of which diet was only one, albeit a conspicuous, part. But the close relations between materia medica and dietetics were further strengthened by the fact that the same substance—depending, of course, on how it was prepared, administered, and the amount—might function sometimes as a foodstuff or as a seasoning agent, at other times as a medicament. Herbs are good examples, but so too are some of the vegetables, for example onion, beet, or cabbage. Even to fruits and nuts there were attributed specific therapeutic properties. But pride of place went to barley. In the form of a thin soup or a thick gruel flavored with various ingredients, a barley tisane was, one is tempted to say, standard bill of fare.[37]

Because of the emphasis placed on dietetic advice as a means of curing specific diseases as well as averting future complaints, it is not surprising that a sizable literature developed.[38] The writings falling within this class vary considerably, from Anthimus' almost illiterate letter to the Emperor Theodoric[39] to Simeon Seth's painfully scholastic analysis of nearly 200 items, many of which were part of everyday living.[40]

There is little need at this point to summarize the substances discussed by the medico-culinary writers, for there is a high correspondence between substances eaten for nourishment and those eaten to correct an imbalance or cure a disease. In the process of describing these substances and enumerating their virtues, attention was sometimes directed to the proper season to eat nuts, for instance, or certain species of fish or fowl. When reduced to rules, that information could be connected with calendaric and astrological data.[41] By so doing, a mystique *and* a rationale was provided, not only for dietetic advice but for a wide class of magical recipes and rituals designed to alleviate suffering.

V. Paramedical Data

The last aspect, which for want of a better term I shall call "paramedical data," is also the most difficult to keep within bounds. Those paramedical data that I shall concentrate on here include amulets, talismans, incantations, and other techniques, all of which had, in addition to these medicinal uses, a further range of religious and magical uses.[42] Admittedly, only a thin line separates magic and religion, and an even more tenuous line separates folk beliefs from the grosser forms of superstition in which supernatural agents are either involved or implicated. My purpose here is not to settle the long-standing controversy of where to draw the line but to call attention to the medical aspects thereof. A simple example will illustrate the problem. For both epilepsy and gout there was a large assortment of simplicia and composita from which to choose;[43] moreover, various diets and regiminary

[36] For τὸ Κωνσταντίνου κολλούριον cf. Ermerins, 135–37. For St. Gregory's salt, cf. E. Jeanselme, "Sels médicamenteux et aromates pris par les Byzantins au cours des repas," *BullSocFrançHistMédical*, 16 (1922), 327. Gregory's role as a healer even extended to praying to him for health and prosperity, cf. Legrand, *Bibliothèque*, II (1881), p. xx.

[37] Cf. E. Darmstädter, "Ptisana," *Archeion*, 15 (1933), 181–201.

[38] Cf. Delatte, *Anecdota*, II, pp. 455–99.

[39] *Anthimi De observatione ciborum ad Theodoricum regem francorum epistula*, ed. E. Liechtenhan (Berlin, 1963) [*CMG* VIII, 1].

[40] *Simeonis Sethii Syntagma de alimentorum facultatibus*, ed. B. Langkavel (Leipzig, 1868).

[41] Cf. Hierophilus, πῶς ὀφείλει διαιτᾶσθαι ἄνθρωπος ἐφ' ἑκάστῳ μηνί, in Delatte, *Anecdota*, II, 456–66. (A different version is printed by Ideler, I, 409–17.) The same calendaric orientation underlies Theodore Prodromus, *Mensium adornatio* (Ideler, I, 418–20).

[42] Cf. G. Schlumberger, "Amulettes byzantins anciens destinés à combattre les malefices et maladies," *REG*, 5 (1892), 73–93; V. Laurent, "Amulettes byzantines et formulaires magiques," *BZ*, 36 (1936), 300–15; and F. Pradel, "Griechische und süditalienische Gebete, Beschwörungen und Rezepte des Mittelalters," RVV, III:3 (1907), 253–403.

[43] For epilepsy, the peony (*Paeonia officinalis* Retz.) was the most popular simplex, partly due to Galen's endorsement (XI, 859 K.), partly because of its prominent role in late Greco-Roman astrology. (cf. A. Olivieri, "La peonia nell'astrologia greca," *RIGI*, 21 [1937], 139–56.) Among the many recipes for composita, cf. Alexander (ed. Puschmann), I, 545–49; Kousis, "Quelques con-

procedures such as baths were also advised.[44] But in addition, amulets, periapts, and semi-precious stones carried on one's person were also thought to be of avail.[45] Generalizing from this example, it is clear that some people regarded the employment of amulets and the like as not essentially different from the use of poultices, decoctions, and clysters.[46] This was especially the case when the amulet was fashioned of a natural product that, in other instances, was regarded as a common medicament or foodstuff. This explains in part, I believe, the frequency with which laurel and olive leaves were employed in medico-magical rituals, some of which had a healing function.

To conclude, it has been my intention to emphasize the most notable aspects of Byzantine materia medica and to provide a few illustrations of each. If space permitted, several other less obvious features would have been included, for example the several different, but ultimately interrelated philosophic theories that provided the rationale of drug action and hence explained why a particular substance was thought to be efficacious for a specific purpose. But since a discussion of such theoretical issues is restricted, on the whole, to a limited range of texts, it has been excluded here. It would also have been desirable to enlarge upon the physical operations and technological processes by means of which the raw or crude substances were prepared for administration and/or capable of being stored away for an indefinite period of time. Finally, I have not thought it necessary to enumerate the diseases and complaints for which drug therapy was recommended, the wide range of therapeutic forms available at the time, or the many alternatives to drug therapy. It is sufficient to say that the Byzantine physician had at his disposal one or more means of treating nearly every complaint with which he was faced. For that purpose texts were required, and it is presumably to such texts that Alexander of Tralles was referring when he stated that by following his recipes it was unnecessary to search further.[47]

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sidérations," 212.20; 213.2; 214.23 etc. For gout, many simplicia were employed, including *Colchicum autumnale* L., the source of colchicine, clinically recognized as specifically effective for gout. There are also many recipes for the preparation of composita, e.g., Alexander (ed. Puschmann), II, 517–47; Kousis, 214.7; M. H. Thomson (note 17 above), p. 73, etc.

[44] Alexander (ed. Puschmann), I, 541–45 recommended a wide range of regiminary measures for epilepsy. A few dietary counsels are recorded by S. Seth (ed. Langkavel) pp. 29.20; 47.15; 109.3; 123.13. For gout, Alexander recommended baths (II, 511–13 Puschm.) and some dietary restrictions (II, 508–10 Puschm.). Alexander, II, 531 Puschm. and Seth, 38.14–19 favor the use of chickpeas (*Cicer arietinum* L.) in the diet. For further details, cf. G. Schmalzbauer, "Medizinisch-Diätetisches über die Podagra aus spätbyzantinischer Zeit," *JÖBG*, 23 (1974), 229–43.

[45] Because the neuro-physiological cause of epilepsy was unknown, a supernatural origin was accepted, on the basis of which epileptics were shunned (cf. F. J. Dölger, "Der Ausschluss der Besessenen von Oblation und Kommunion," *Antike und Christentum*, 4 (1974), 110–29). As a consequence, magical devices were commonly recommended (cf. Alexander I, 557, 561, 567 [Puschm.]; Delatte, *Anecdota*, I, 486.11; 618.17), though rational therapy was still attempted (A. Philipsborn, "ΙΕΡΑ ΝΟΣΟΣ und die Spezial-Anstalt des Pantokrator-Krankenhauses," *Byzantion*, 33 (1963), 223–30). In general, see E. Jeanselme, "L'epilepsie sur le trône de Byzance," *BullSocFrançHistMédical*, 18 (1924), 225–74.

[46] Anna Chatzenikolaou, Μετάλλινα μαγικὰ εἰκονίδια Κωνσταντίνου καὶ Ἑλένης, Ἐπ.Ἑτ.Βυζ.Σπ., 23 (1953), 508–18.

[47] Alexander, II, 109 Puschm.

Medicines and Spices, with special reference to medieval monastic accounts, compiled by Marjorie Jenkins from notes by the late Nancy Jenkins, F.P.S.

In an age when the treatment of disease has changed so greatly, it is interesting to consider the medicines and spices, many still prescribed, which were used by our ancestors and their contemporaries in the Middle Ages.

In the accounts of the Prior, the Cellarer and the Infirmarer of any of the great pre-Reformation abbeys and cathedral priories there are frequent references to the money spent on spices for culinary and medicinal use. The problem of feeding cattle through the winter was insuperable. Most of the sheep and oxen were therefore killed in the autumn and the dried or salt meat was made more palatable with culinary spices. Cumin was popular in the Dark Ages and in the year 716 A.D. the monastery of Corbie in Picardy had used 150 pounds of it. As trade with the East increased, pepper and ginger became the most popular spices in England; cloves and saffron were much used, as well as mace and nutmegs in spite of their high price.[1]

According to the Rule of Saint Benedict all monks except the weak and the sick were forbidden to eat the flesh of quadrupeds but monks who had undergone the periodical blood-letting usually ate meat for a few days, often in a hall set apart from the Refectory for this purpose, such as the Misericorde or "Corde Hall" at Westminster Abbey. Further, while in a community such as Norwich Cathedral Priory there were between fifty and sixty monks,[2] during the greater part of the Middle Ages the whole community, including servants, probably numbered about 260, most of whom would eat meat. Meat was also served to visitors at the Abbot's table.

Some idea of the importance of spices during the Middle Ages may be gathered from the way in which they were taxed by rules seeking to raise money. Thus when Edward I granted the Patent of Pontage in the year 1305 to raise funds for repairing London Bridge, the goods liable to toll included anise, cubebs and licorice. The tariff of duties levied at Acre in Palestine in the twelfth century included ginger, which was also among the commodities taxed in the thirteenth century at Barcelona, at Marseilles and at Paris. When the Counts of Provence levied duty on the towns of Aix, Tarascon, Avignon, Arles and others, the goods taxed included pepper, ginger, cloves, cubebs, saffron, cumin, anise, licorice, sugar and dates. Pepper was accepted as payment of rents, and a "pepper-rent" was the obligation of a tenant to supply his landlord with a definite quantity of pepper, usually a pound. The price of pepper throughout the Middle Ages was always very high, because of its popularity and the difficulty of ensuring supplies from the East. The search for a sea passage to India may have been partly due to the pepper trade. Its price per pound, like that of ginger, was roughly the same as the price of a sheep. Other spices used as rents were mustard, which was a regular part of the revenue of the convent lands of the Abbey of St. Germain dès Pres in Paris, and cumin, a pound of which was paid by the Treasurer of St. Augustine's Abbey, Bristol, to the Lord of Wraxall in the year 1491-2, for Radford Mill.

Spices were often given as presents and the magnificent gifts which had been made by the Emperor Constantine to Saint Sylvester, Bishop of Rome in the fourth century, included saffron, pepper and cloves, as well as myrrh, storax, balsam and other aromatics. A thousand years later the Khan of Cathay sent presents to Pope Benedict XII at Avignon which included camphor, myrrh, musk and spices, together with gold, silver, silk and jewels; but none of these reached the Pope, for all were plundered on the journey from East to

West. Nearer home, at St. Alban's, between the years 1421 and 1440, we find the Abbey Infirmarer giving a Christmas present to the Abbot which included mace, galingal, cubebs, cloves and ginger.

Spices used for flavouring were normally paid for by the Cellarer and those used medicinally by the Infirmarer. Before the endowment of the Infirmary at Westminster Abbey in the twelfth century, it was the charge of the Chamberlain to supply medicines for the sick, and the only drug allowed except by special favour was licorice.[3] Later, the Infirmarer's Rolls give frequent purchases of honey, ginger, camomile and "popye".[4]

At Canterbury Cathedral Priory the monks were given herbs, cordials of sweet sugar, lozenges and ointments when they were ill,[5] and the accounts for 1467 include expenses for cloves, mace, saffron and "reyson coronts".[6]

The accounts of the Master of the Cellar at Norwich before 1350 show purchases of spices, some culinary and some medicinal, which include fennel, ginger, saffron, galangal, pepper, garlic, peony, cloves, figs, almonds, licorice, cinnamon, honey, mace and cubebs. In 1369 the Cellarer bought, among other things, five pounds of saffron and ten pounds of pepper. He also bought cumin and "divers spices", and for 52 gallons of honey he paid 2s.8d. The spice most used at Norwich was ginger and between the years 1346 and 1349 payments for it were £4.16s.0d., £5.4s.6d., £5.10s.6d. and £6.12s.0d.[7] Another purchase of the Master of the Cellar at Norwich was "kanale". This might be cassia bark which was known in London as "Canel" and was sold at 10d a pound in 1264. Kanale cannot have been canella as this was not introduced to Europe until the beginning of the seventeenth century.[8]

Of the drugs found in these accounts, senna was mentioned by Isaac the Jew, a physician of the tenth century, and galingal by Rhazes, the Arab physician (A.D. 865-925). In a list of books belonging to the Cistercian Abbey of Meaux there are three medical books, those of Johannes Platearius of Salerno, Isaac Judaeus and Rhazes.[9] Rhazes is one of the authorities whom Chaucer's Doctour of Phisick "well knew".[10]

It is noticeable that medicinal plants which are indigenous or easily cultivated in our climate are not mentioned in these accounts, presumably because they were grown in the infirmary garden and therefore cost nothing. We know that Atropa Belladonna was found at Kinloss Abbey and at Vale Crucis Abbey. The only place where peony now grows wild in Great Britain is on Steep Holme in the Bristol Channel, where, in the thirteenth century, there was a priory belonging to the Augustinian Canons of Studley.[11] Peony used also to be found in the woods near Winchcombe in Gloucestershire, where there was a great abbey from at least the eighth century until the Dissolution.[12] Probably the plant owes its survival on Steep Holme to the loneliness of the island. Certainly a garden was a normal adjunct of a monastic infirmary, and in some plans it is shown as partly planted with herbs. It was also meant for the refreshment and seclusion of the sick, and in his Visitation to the Diocese of Worcester in July 1301, Archbishop Winchelsey of Canterbury ordered that the infirmary servants were not to make a noise in going from the infirmary garden in case they might disturb the sick.[13] This, together with the notes on spices and medicines given, throws an interesting sidelight on the care of the sick in the great monasteries of the Middle Ages.

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Notes

1 *The Rule of Saint Benedict*, tr. Abbot Gasquet (London 1909), ch. xxxix, p. 72.

2 Knowles and Hadcock, *Medieval Religious Houses: England and Wales* (London 1953), p. 72.

3 H.F. Westlake, *Westminster Abbey* (London 1923), p. 339.

4 *Ibid.*, p. 334. The author was also indebted to Lawrence Tanner, C.V.O., M.A., F.S.A. sometime Keeper of the Muniments, Westminster Abbey.

5 E.g., MS D.E. 58 in the Dean and Chapter Library Canterbury, dated c.1523, for a reflex of which by Messrs E.W. Crump Ltd. of Canterbury, the author was indebted to the Keeper of the Manuscripts, Canterbury Cathedral.

6 Woodruff and Danks, *Memorials of the Cathedral and Priory of Christ in Canterbury* (London 1912), p. 230.

7 H.W. Saunders, *Introduction to the Obedientiary and Manor Rolls of Norwich Cathedral Priory* (Norwich 1930).

8 Fluckiger and Hanbury, *Pharmacographia* (London 1874), p. 68.

9 *Chronica Monasterii de Melsa*. Rolls Series.

10 Chaucer, Prologue to the *Canterbury Tales*, ed. A.C. Cawley (Dent: London 1958), p. 432.

11 Knowles and Hadcock, *Op. cit.*, p. 154.

12 *Ibid.*, p. 81.

13 *Historia et Cartularium Monasterii Sancti Petri Gloucestriae*. Rolls Series.

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The Medieval Herbal Tradition of Macer Floridus
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The Medieval Herbal Tradition of Macer Floridus

by Bruce P. Flood, Jr.*

IN THE HISTORY of pharmacy and botanical therapy in the Middle Ages the literature of Constantinus Africanus and the school of Salerno come to mind immediately as authoritative sources. No one can deny their influence on medieval botany and medicine, yet curiously enough what was undoubtedly one of the more widely read works in this field during the entire medieval period appeared contemporaneously with both Constantinus and the rise of Salerno. This work, an herbal entitled *Macer Floridus De virtutibus Herbarum,* consists of a catalogue of 77 herbs and their supposed medicinal properties; all expressed in 2269 lines of vulgar Latin verse. Even more curious is the fact that this poem not only refers to earlier medieval and botanical authors such as Walafrid Strabo; it was itself copied in part into the most significant remaining document of the medical school at Salerno, the *Regimen Sanitatis Salernitanum.*[1] Macer Floridus is important not only for medical and botanical knowledge but also for a wider range of medieval intellectual history. Its significance lies in the fact that it is the first document of such length to indicate a renewed interest in these subjects in the 11th century, and appears to reflect no direct influence from any Arabic sources.[2]

What is the provenance of this literary work? As the researches of the 19th century German medical historians Valentin Rose and H. Stadler have shown, virtually the entire poem is based upon Pliny the Elder's *Historia Naturalis.* Many Renaissance scholars believed Macer to have been written during the time of the Roman Empire, yet because of a clear reference in it to Walafrid Strabo (806?-849) it is obvious that the author could not have written it before the 9th century.[3] In addition, as at least two other scholars have pointed out, since it fails to mention any Arabic literary sources or any of the drugs introduced by the writings of Avicenna, and because portions of it do appear in the *Regimen* of Salerno, it must have been composed somewhere between the death of Strabo and the establishment of Arabic medicine in the west near the end of the 9th century.[4]

Who was Macer Floridus? The answer to this question might give us a more precise date as to when it was written. The name "Floridus" was probably a fanciful name inspired by the subject matter, and "Macer" may have been used to convince the reader that the poem had its origins in the time of Augustus, very likely from the pen of the Roman poet and naturalist Aemilius Licinius Macer (85-15 B.C.). Conversely it could have been adopted after the manner of the Carolingian literary savants who appropriated the names of famous classical literary personalities. The medieval writer Gaudentius Merula (1424-1494)

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* Assistant Professor, Department of History, University of Wisconsin-Whitewater, Whitewater, WI 53190.

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said that the real author was a certain doctor named Odo, whose name he claimed to have seen in an older medical text. At least two available manuscripts of the work contain appended references to one "Odo Magdunensis."[5] The botanical historian Ernst Meyer, and Salvatore de Renzi, editor of the Salernitan collection, maintain that this Odo was a southern Italian, on the grounds that is Greek equivalent accompanies each Latin herbal noun, and because names of illnesses and other Greek terms and illusions to mythological subjects appear in the poem.[6] The German literary historian Max Manitius, on the other hand, points out that the Greek is extremely corrupt, which suggests that it was less grammatically correct than Meyer indicates. Certainly a slight knowledge of Greek was not confined exclusively to southern Italy, since traces of it were preserved in western France until the 11th century. In fact Manitius himself, along with the 18th century historian Albrecht von Haller and the early 19th century physician Ludwig Choulant believe Odo to have been a Frenchman. Manitius argues that certain plant names, such as *nardus gallica, celtica spica,* and *derte* (in French *dartre*), while at first ignored in western France along with certain other latinized plant names, do appear later in this area.[7] Haller uses philological evidence in stating that because the poet translated "isatis" to "gaisola" he must have been French, and Choulant shares this view.[8] Manitius goes one step further by dating Odo somewhere in the first half of the 11th century because Odo was privy to Walafrid Strabo's *De cultura hortorum*, the oldest manuscript of which was constructed during that century. Stadler, by proving that parts of the poem have come from Constantinus Africanus, would narrow the probable date to between 1070 and 1112, the latter being the year of the death of Sigebertus Gemblacensis, who was the first subsequent medieval author to mention Macer. A closer locating of this Odo rests with the significance of the word "Magdunensis," which according to Cyrill Resak should be equivalent to Meudon, which means Moldunum or Modunum, a reference to Meung-sur-Loire, a town located on the Loire river between Blois and Orleans. Manitius' analysis here indicates that the traces of Greek could mean that Odo had been trained in a school either at Fleury or Orleans, both of which are in the vicinity of Meung.[9] So these researches indicate that the author of *Macer Floridus* may have been a Frenchman who lived near Meung somewhere between 1070 and 1112, yet there has been no conclusive evidence.[10]

Literary correlation has shown that Macer is based not only on Pliny's Historia Naturalis, but also on a work entitled *Medicina* by the 2nd century Roman historian and medical writer Gargilius Martialis, and on Dioscorides' *De materia medica*. Manitius feels the author may have derived most of the Pliny through Gargilius, since so many of Pliny's phrases recur in Gargilius' work. In any case at least 38 chapters (including the *Spuria)* are derived for the most part from Dioscorides, Pliny and Gargilius. Also, beside Walafrid Strabo, the poet mentions many others, including Galen, Hippocrates and Menemachus as well as Paladius.[11] Where he does not identify his authority specifically by name he utilizes such words as "fertur," "dicitur," "auctores," or "doctis medicis." Stadler notes the extremely unorganized manner in which the material is used. The text of a single author may run for nearly the length of a chapter with its introduction being taken from a different source. Other chapters are assembled in similar, mosaic-like fashion.[12]

Structurally the work consists of 2756 unrhymed lines of dactylic hexameter verse (including the *Spuria),* although the number of verses and order of chapters varies greatly in the several manuscripts and printed editions. Its 77 chapters are of unequal length and are divided into two parts: one concerned primarily with herbs, and the other (beginning with verse 2056 in Choulant's

critical edition) with certain species of herbs which were thought to possess rare medicinal properties. There are 20 additional chapters, called in Choulant's edition the *Spuria Macri,* which were appended later in the style of the original poem. As to literary quality, scholars refer to the Latin as "barbaric" and "dry and arid," and one modern French expert considers it a collection of mnemonic verses that should not be dignified by the term poem.[13] Certainly the pleasing style of Walafrid Strabo is completely absent. One is struck by the extremely colorless and didactic nature of the work, especially the repetition in describing each herb and its medicinal uses, and the joining of descriptions with endless conjunctions and prepositions.

Yet questions persist as to why the poem was written, and as to what accounts for its wide circulation in the Middle Ages and after. The scarcity of medical and botanical treatises for general use at this time, the reverence for classical writers among medieval intellectuals, and a strong reliance upon superstition, folk medicine and home remedies probably account for its widespread circulation. This herbal could have been written by either a layman or learned clerk for general consumption, since the constant reference to female ailments, contraceptive preparations and aphrodisiacs would suggest it had not been written by an ascetic recluse (without excluding the possibility of its having been written by a worldly monk). It could very well have served as a vehicle enabling the writer to display his classical knowledge and even imitate the classics much after the fashion of a Boethius or a Cassiodorus, similar to what Polydore Virgil did in the 15th century. There is no direct evidence of experimentation, and some question whether or not the author actually ever saw or attempted to use any of the herbs of which he wrote. Nor does he affirm having witnessed any of the cures he mentions.[14]

Whatever one may think about the value or the purpose of this herbal there is no disputing its tremendous influence on medical and botanical literature from the early Middle Ages on. It was known by some of the famous medieval mendicant preachers such as the English Dominican Master Rypon of Durham, a contemporary of Chaucer's, and the German Franciscan Brother Berthold.[15] One researcher has estimated that Macer was among the sources of St. Hildegard of Bingen, as evidenced in the "De Plantis" section of her *Physica.* A certain Master Bartolomeus of Salerno (ca. 1150) mentioned it in the appendix to his *Introductiones et experimenta in practicam Hippocratis, Galeni, Constantini, graecorum medicarum* (a work which by the 13th century was translated into high and low German and Danish), and it was also one of three major sources used by Rufinus in his *De Virtutibus Herbarum.* Max Manitius believed that the Salernitan medical writer Matthias Platearius quoted Macer in the chapter on Absinth in his *Circa Instans,* and although there is no mention or citation of the poem, some passages bear a close similarity to the poem.[16] It is certain that the French Dominican Vincent of Beauvais (1190-1264) copied about two-thirds of the poem into his *Speculum Naturale* (books IX-XV), and that Alexander Neckam (1157-1217) refers to Macer in his *De Naturis Rerum.*[17] The poem is also cited by medieval grammarians and library commentators. One example is its inclusion in Hugo of Trimberg's compilation in 1280 of typical authors studied in the schools.[18]

Macer Floridus also figures quite prominently in the sources used by German botanists in the later Middle Ages and the Renaissance. It is mentioned in one of the first herbals published in Germany which was printed in 1484. Three of the most famous 16th century German scientists, Paracelsus (1493-1554), Jerome Bock of Strassbourg (1498-1554), and Jacob Theodore of Bergzabern (1520-1590) all refer to this work in their medical texts.[19] When, during the 17th century, medicine and botany came to rely more heavily on experimental

methods and increasingly less on the authority of the ancients, Macer was gradually abandoned; although it was still listed by one writer as late as 1740 as an authoritative medical work.[20] It is interesting to note that in the 14th century a number of herbals appeared bearing the title "Macer," yet differing fundamentally in their content from the Latin Macer Floridus. This might be given as evidence that by this time the term "Macer" denoted *any* catalogue of herbs with their medicinal uses.[21]

Numerous copies of Macer Floridus exist in both manuscript and printed form. At least three manuscripts are in the British Museum. The oldest we know is an incomplete fragment in the Staadtsarchiv in Vienna. Most of the manuscripts are found in Germany, France and England in that order of frequency. Printed versions began appearing in 1477 with a Venice edition and then it was published further north, particularly in France, Switzerland and Germany. The most recently printed copy is the critical edition by the physician Ludwig Choulant in 1832, which is based almost solely on manuscripts and printed editions found in the libraries of Dresden and Leipzig. The late Lynn Thorndike used this rendition in his critical edition of the herbal of Rufinus (mentioned above).[22]

One testimonial to the wide influence Macer had on subsequent medical and botanical commentators is the number of translations of the herbal into vernacular languages and dialects. These appear, in varying forms, in German, French, Danish, Italian, Catalan, Middle Dutch and Middle English.[23] Although the bulk of the material presented in the herbal is borrowed from earlier sources and rendered in a tedious style, the evidence here presented makes it clear that Macer Floridus was one important avenue of transmission for ancient medical lore and was one of the most influential works on botanical pharmacy and therapeutics from the 11th century to the Renaissance and after.

Notes and References

1. Macer Floridus, *A Middle English Translation of Macer Floridus De viribus herbarum*, ed. by Gösta Frisk (Upsala: Lindequist; Cambridge, Mass.: Harvard University Press, 1949), p. 12. For the full text of the *Regimen Sanitatis Salernitanum* see Salvatore de Renzi, *Collectio Salernitana* (Napoli: Sebizio, 1857).
2. H. Stadler, "Die Quellen des Macer Floridus," *Archiv für die Geschichte der Naturwissenschaft und Technik*, I (1909), 53-56, 61. This author argues that some parts of *Macer Floridus* may have been taken from Constantinus Africanus.
3. Lynn Thorndike, *A History of Magic and Experimental Science* (New York: MacMillan, 1923) I, 612-613. Ludwig Choulant (ed.), *Macer Floridus de viribus herbarum* (Lipsiae: Leopold Voss, 1832), p.2 as well as p. 65, versus 900-906 "Ligusticum." Adolf Ebert, *Allgemeine Geschichte der Literatur des Mittelalters in Abendland* (Leipzig: F.C.W. Vogel, 1887), III, 352n., Jo. Baptista Morgagni, *Opuscula Miscellanea* (Venetiis: Remondiniana, 1763), pp. 103-105, Cyrill Resak, *Odo Magdunensis der Verfasser des "Macer Floridus" und der deutsche Leipziger Macer Text* (Borna-Leipzig: R. Noske, 1917), pp. 7-8, Walahfrid Strabo, *Hortulus*, trans. by Raef Payne (Pittsburgh: Hunt Botanical Library, 1966), p. 45, Valentin Rose, "Über Medicina Plinii," *Hermes*, VIII (1874), 63n.
4. Baudry de Balzac, "Recherches sur le pseudonyme Floridus Macer," *Memoires de la Sociètè des Sciences morales des lettres et des artes de Seine-et-Oise*, I (1847), 87, 126, Ernst Meyer, *Geschichte der Botanik* (Königsberg: Borntrager, 1857), III, 432.
5. *Isidori Hipalenisis Episcopi Etymologia sive Originum*, ed. by W. M. Lindsay (Oxonii: Clarendoniano, 1911), XII, 4, 24: "Chelichas: hic per quam labitur terram, fumare facit: quam sic Macer describit (8):
   Seu terga expirant spumantia viris,
   Seu terra fumat qua teter labitur anguis."
   See also Baudry de Balzac, p. 114, 126-128, Choulant, *Macer*, pp. 1-2, C. T. Lewis and Charles Short, *Harpers Latin Dictionary* (New York: Harper, 1882), p. 326 under the word "chelydrus," Gaudentius Merula, *De Gallorum Cisalpinorum antiquitate ac origine* (Bergomi: A. Antonii, 1529), p. 54: "Sed hic libellus qui sub Macri nomine circunfertur non-huius est, sed Odonis cuiusdam medici ut ipse vidi in codice quodam antiquissimo." See also Meyer, p. 427, Rose, p. 63.
6. Meyer, p. 430. As examples he cites in verse 1202 "Brassica" for the latin "Caulis"; in verse 1489 "Elna" for the latin "Enula"; and in verse 2015 "Lolium" for the latin "Nigella." See also Renzi, I, 113.
7. Max Manitius, *Geschichte der lateinischen Literatur* (München: Beck, 1923), II, 543, 545. "Radix melaena" occurs in verse 122 "nardus gallica" in verses 61-64, "celtica spica" in verse 2200 and "derte " in

verse 299. See also Albrecht von Haller, *Bibliotheca Botanica* (Tiguri: Orell, Gessner, Fussli, 1771), I, 215.

8. Ludwig Choulant, *Handbuch der Bücherkunde für die Ältere Medizin* (Leipzig: Voss, 1848), p. 234: "Dass derselbe in Frankreich gelebt haben müsse, ist aus der Orthographie und manchen Namen der Kräuter *(Gaisdo, Jusquiamus, Paratella, Gingiber,)* so wie aus manchen anderen Angaben wahrscheinlich." See also A. Tschirch and E. O. von Lippmann, *Allgemeine Pharmakognosie* (Leipzig: Bernhard Tauchnitz,1933), pp. 1391-1392.
9. Manitius, pp. 539-540, Morgagni, p. 104, Friederich Boerner, "De Aemilio Macro eiusque Rariore Hodie Opusculo de Virtutibus Herbarum," *Noctes Guelphicae* (Rostochii et Wismariae: Andr. et Iac. Boednerum, 1775), p. 116. Hermann Fischer, *Mittelalterlichen Pflanzenkunde* (München: Münchnerdrucke, 1929), p. 16.
10. Stadler, pp. 62, 65. For Sigebertus Gemblacensis see Joannis Albertus Fabricius, *Bibliotheca ecclesiastica* (Hamburg: C. Liebegeit and T. C. Felgmer, 1718), p. 94 and Joannis Albertus Fabricius, *Bibiotheca Latina* (facs. ed. Graz: Akademische Druck und Verlaganstalt, 1962), V. 3.
11. Stadler, p. 64, Choulant, *Macer*, pp. 5-14.
12. Stadler, pp. 53-56, 61.
13. Meyer, pp. 426, 433, Baudry de Balzac, p.85, Choulant, *Handbuch*, p. 233, Ebert, pp. 352-353.
14. John M. Riddle, "Theory and Practice in Medieval Medicine," *Viator*, V (1974), 177, Jerry W. Stannard, "Medieval Herbals and their Development," *Clio Medica*, IX, no. 1 (March 1974), 23-32 as well as his "The Herbal as a Medical Document," *Bulletin of the History of Medicine*, XLIII, no. 3 (May-June 1969), 217.
15. G. R. Owst, *Literature and Pulpit in Medieval England* (Oxford: Basil Blackwell, 1961), p. 192, Franz Pfeiffer (ed.), *Berthold von Regensburg: Vollstandige Ausgabe seiner Predigten mit Anmerkungen* (Berlin: Walter de Gruyter, 1965), I, 517, Resak, p. 17: "...unde lebete noch her Galiênus unde her Constantinus unde her Avicennâ unde her Macer unde her Bartholomêus,—die wâren die aller hôhesten meister diu von Erzenîe ie gelâsen, unde habent alle Künste erfunden und erdâht, die von Erzenîe ie ward erdâht—, unde lebten die alle noch, sie möhtenetelîchen siechtuom niemer gebüezen."
16. H. Schelenz, *Geschichte der Parmazie* (Hildesheim: Georg Olms, 1912), pp. 306, 324, J. Zacher, "Macer Floridus und die Entstehung der deutschen Botanik," *Zeitschrift für deutsche Philologie*, XII (1881), 194n.2, 197-198, Lynn Thorndike, *The Herbal of Rufinus* (Chicago: University of Chicago Pres, 1946), p. xxix and for examples of quotations of Macer see pp. 201, 228, Nicolaus Praepositi, *Dispensarium...Nicolai Praepositi ad aromatarios...:*(Lugduni: Gabiano, 1537), p.74, Manitius, p. 546, Choulant, *Macer*, p. 32, line 100.
17. Vincentius Bellovacensis, *Speculum Naturale* (Argentinae, impressor qui dicitur legendae aureae, ca. 1481, ca. 1483), Klebs 1036.2 Book XI, chapter 79, "De Feniculo," and Book XI, chapter 101, "De Nepeta," The similarity of Vincentius and the critical edition of Choulant is readily apparent. Alexander Neckam, *De Naturis Rerum*, ed. by Thomas Wright (London: Longmans, Green, Longmans, Roberts and Green, 1863), p. 275: "Effectus autem herbarum et proprietatis dilingenter prosequuntur Macer et Dioscorides et multi alii."
18. See Manitius, p. 546 where he lists items 271-278 found in J. Huemer's edition of Hugo of Trimberg's work in the former's *Ein Quellenbuch zur lateinische Literaturgeschichte des Mittelalters* (Vienna: Akademie Sitzungsberichte, 1881), p. 176. See also John E. Sandys, *History of Classical Scholarship* (Cambridge: Cambridge University Press, 1908), I, 622.
19. G. A. Pritzel, *Thesaurus Literaturae Botanicae* (Lipsiae: Brockhaus, 1872), p. 199, Meyer, p. 184, C. F. Baehr, *Geschichte der Römische Literatur* (Karlsruhe: Chr. Fr. Muller'schen Hofbuchhandlung, 1840), III, 141, Choulant, *Handbuch*, p. 236, Choulant, *Macer*, p. 4, Baudry de Balzac, p. 86, Manitius, p. 547. For Paracelsus' remarks see J. Huser (ed.), *Paracelsus Bucher und Schriften* (Basel: C. Waldkirch, 1589), pp. 1070-1088, 1095-1100, Heironymus Bock, *Neue Kreutterbuch* (Strassburg: Rihel, 1577), sig. folio liii verso and p. 24. See also Choulant, *Macer*, p. 91, line 1532, and Zacher, pp. 205-207. On p. 211 Zacher maintains he has found no reference to Aemilius Macer among the works of Bock.
20. A. Joanne-Francisco Seguierio, *Bibliotheca Botanica...*(Lugdunibatavorum: apud Cornelim Haak, 1740), pp. 273-274.
21. E. S. Rohde, *The Old English Herbals* (London: Longmans and Co., 1922), p. 42, Frisk, p. 16. See also R. R. Johnson, "A Newe Herball of Macer and Banckes's Herball: Notes on Robert Wyer and the Printing of Cheap Handbooks of Science in the Sixteenth Century," *Bulletin of the History of Medicine*, XV (1944), 249, W. L. Wardale (ed.), *Albrecht van Borgunnien's treatise on medicine (Sloane Ms. 3002, British Museum)* (London: Oxford University Press, 1936), pp. xxiv-xxv.
22. Thorndike, *Herbal of Rufinus*, p. xxxii n. 34.
23. W. F. Daems, "Die mnl. Macerglossen in Ms. 6838A der Nationalen Bibliothek zu Paris," *Janus: Revue internationale de l'histoire des sciences, de la medicine, de la pharmacie et de la technique*, LIII (1966), 22. For the French translation see Macer Floridus, *Des Vertus des Plantes*, traduit par M. Louis Baudet (Paris: C. L. F. Panckoucke, 1845), with commentary in G. Sarton, *Introduction to the History of Science* (Baltimore: Williams and Wilkins, 1927-1948), pp. 765-767, Frisk, p. 5. For the Catalan version see Cesar E. Dubler (ed.), *La "Materia Medica" de Dioscorides Trasmision medieval y Reacentista* (Barcelona: Tipografia Emporium, 1953), I, xxi. For the various German translations see Jerry W. Stannard, "Greco-Roman Materia Medica in Medieval Germany," *Bulletin of the History of Medicine*, XLVI, no. 5 (September-October 1972), 468 n. 86.

THE LEMON IN CHINA AND ELSEWHERE

BERTHOLD LAUFER
FIELD MUSEUM

OF THE NUMEROUS useful fruits that we owe to India the lemon is the most democratic and the most widely known. It has become a denizen of this world and, with its Indic name, has penetrated even into the darkest parts of Africa and the tropical jungles of South America. Next to the word "tobacco," the word type "lemon," of Indic origin, is the most universal, reverberating from every tongue of the globe. To cite a few examples—Tukano *erimoá* and Tuyuka *uĩnimoá* (of the Betoya group in South America on the Upper Rio Negro) are derived from Portuguese *limão*. Tupi, the lingua franca of Brazil, which has adopted many loan-words from the Portuguese, upholds the word for lemon in the form *limaw*, although the liquid *l* is foreign to the language (Tatevin, *La langue Tapihiya*, 1910, p. 142). Along the east coast of Africa we hear *limao* or *ndimu* for the fruit, *mlimao* for the tree.

It was heretofore supposed that the lemon is of recent origin in China, introduced by "foreigners." It will be shown that this conception of the matter is erroneous and that Chinese acquaintance with the lemon dates from the middle of the twelfth century under the Sung dynasty.

Dr. W. T. Swingle, in his revision of the genera Citrus and Poncirus in China (in C. S. Sargent, *Plantae Wilsonianae*, 1914, II, pp. 127-137), has restored for the lemon the name *Citrus limonia* Osbeck on the ground that this is the oldest available name for the lemon (1765), i. e. in our botanical literature. He says that the lemon is still commonly grown and sold in pots as in Osbeck's day (see also his article "Citrus" in Bailey's *Cyclopedia of Horticulture*, 1914, p. 781).[1]

[1] Lemons are pointed out in our literature on China prior to Osbeck's time. We read in Du Halde's *Description of the Empire of China* (London, 1738, I, p. 317): "Limons and citrons are very common in some southern provinces, and extraordinary large; but these are scarce ever eaten, being only made use of for ornaments in houses, where they put seven or eight in a china dish, to please the sight and smell; however, they are exceeding good when candy'd. Another sort of limon, not much larger than a walnut, is likewise in great esteem; it is round, green, and sharp, being reckon'd

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F. P. Smith (*Contributions towards the Materia Medica* etc. *of China,* 1871, p. 131) cites *ning-mung* 檸檬 ("lemon") and observes, "No mention is known to be made of the lemon in the *Pen ts'ao.* The characters here given are from English dictionaries." He further gives *ning-mung chi* 汁, "lemon-juice" as "a name introduced by foreigners and applied to lime juice as well," and *ning-mung-shwi* 水 ("lemonade").

De Candolle (*Origin of Cultivated Plants,* p. 179) doubts whether the area originally covered by the lemon includes China or the Malay Archipelago, and continues, "Loureiro mentions *Citrus medica* in Cochinchina only as a cultivated plant, and Bretschneider tells us that the lemon has Chinese names which do not exist in the ancient writings and for which the written characters are complicated, indications of a foreign species. It may, he says, have been introduced." In his article "The Study and Value of Chinese Botanical Works" (*Chinese Recorder,* 1870, p. 178), Bretschneider wrote as follows: "The common lemon-tree at Peking is frequently raised in a dwarf form in pots as an ornamental shrub and also on account of the lemons which it produces and which do not differ from our European lemons. It is called 香桃 *siang t'ao* ['aromatic peach'] [2] and may have been introduced. This name is not in Chinese books. The name 檸檬 *ning-mêng* given to the lemon in Bridgman's Chrestomathy (p. 443) is not to be found either in Chinese books. Perhaps by these sounds the Hindustan name of the lemon, being *nee-moo,* is rendered."

In *Mesny's Chinese Miscellany* (Shanghai, IV, 1905, p. 8) we read, "Lemonade, *ning meng shui, Ho-lan shui* 荷蘭水,[3] *ch'ang*

excellent for ragous. The tree that bears them is sometimes put in boxes, and serves to adorn the outward courts or halls of houses."

[2] MacGillivray, in his *Mandarin-Romanized Dictionary* (2nd ed., 1907, p. 261) lists 香圓 or 橼 as vernacular names of the lemon, but these, properly speaking, refer to the Buddha-hand citrus (*Citrus sarcodactylus*) 香櫞。俗作圓 (see *Pen ts'ao kang mu,* chap. 30, p. 13). Giles No. 4256 renders *hiang yüan* by "lemon," but under No. 13,738 defines it as "the Chinese citron—a variety of *Citrus medica* L." Perrot and Hurrier (*Matière médicale et pharmacopée sino-annamites,* p. 137) explain *hiang yüan* as *Citrus decumana.*

[3] This, as a matter of fact, is a general term for soda water and proves nothing in favor of an introduction of the lemon through Hollanders, as possibly might be inferred from the name.

sheng kuo shui 長生菓水. In western China the true lemon grows and the fruit remains on the tree for years, hence its name *ch'ang sheng kuo,* i. e. long life fruit. This name is, however, given to peanuts or groundnuts at Shanghai."

G. A. Stuart (*Chinese Materia Medica,* 1911, p. 117) writes, "The lemon has been called by the same name by foreigners in China, as well as by the names *ning-meng* 檸檬 and *li-meng* 黎檬. But it is pretty certain that the lemon does not grow in China proper, or at least has been but lately introduced, and therefore it is not named." All this turns out to be erroneous.

It is correct, as stated by F. P. Smith, that the lemon is not mentioned in the *Pen ts'ao kang mu* of Li Shi-chen. This is accounted for by the fact that Li Shi-chen was not a botanist, but a herbalist and pharmacologist, his interest in plants and fruits being limited to their use in the pharmacopœa, and as the lemon was not medicinally employed up to his time, it failed to receive a place in his work. What F. P. Smith and his successors did not note, however, is that the lemon is clearly described in the *Pen ts'ao kang mu shi i* (chap. 7, p. 60b) and in the *Chi wu ming shi t'u k'ao* (sect. 果, chap. 16, p. 82). The former work gives extracts from the *Ling nan tsa ki and Yüe yü;* the latter cites the *Kwei hai yü heng chi, Ling nan tsa ki,* and *Nan yüe pi ki.* Yet neither points out the fundamental text of the *Ling wai tai ta.*[4]

The earliest reference to the lemon in Chinese records is made by Fan Ch'eng-ta 范成大 (A. D. 1126-93), in his *Kwei hai yü heng chi* 桂海虞衡志 (preface dated A. D. 1175; ed. of *Chi pu tsu chai ts'ung shu,* p. 25b), who writes as follows: "The *li-mung* fruit 黎朦子 has the size of a large plum; again, it resembles a small orange, and is exceedingly sour to the taste." No further information is given. The *Kü lu* 橘錄, a treatise on oranges, edited in A. D. 1178 (translated by Kiang Kang-hu and Hagerty in *T'oung Pao,* 1923, pp. 63-96) is reticent as to the lemon.

The earliest important description of the lemon is contained in the *Ling wai tai ta* 嶺外代答, written by Chou K'ü-fei 周去非 in A. D. 1178 (ed. of *Chi pu tsu chai ts'ung shu,* chap. 8, p. 8b). In a notice on the fruits cultivated in southern China at this time,

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[4] The present case goes to show conclusively that a plant cannot be assumed to be unknown to the Chinese simply for the reason that it is not mentioned in the *Pen ts'ao* literature.

the author mentions the *li-mung* fruit 黎朦子 as "being of the size of a large plum; again, it resembles a small orange, and is exceedingly sour to the taste" (same definition as in *Kwei hai yü heng chi*), and continues, "Some people say that it has come to us from the southern barbarians 或云自南蕃來. The people of P'an-yü (Canton) do not use vinegar in large quantity, but avail themselves in particular of the juice of this fruit, which is well known for its sourness, squeezing the juice out with a spoon. They also boil it in honey, soak it in a brine, and dry it at the sun when it is ready for consumption."[5]

There is no doubt that the lemon is visualized in this text and that the Cantonese made a sensible use of it. The Arabs also preserved lemons in salt (Ibn Baṭūṭa, transl. by Defrémery and Sanguinetti, III, p. 126). The lemon, we may conclude, was introduced into what is now Kwang-tung Province under the Sung dynasty, probably in the first part of the twelfth century, possibly a little earlier, since Fan Ch'eng-ta and Chou K'ü-fei met it in the south as a well established cultivation. The tradition that it came to China from the "Southern Barbarians," vague as it may be, is entirely credible, and is confirmed by the non-Chinese name *li-mung* which was received with the fruit from some foreign people. The *Shanghai Medical Dictionary* classifies it "among fruits of the Barbarians" 夷果. Prior to the twelfth century the lemon must therefore have migrated from India to Indo-China and possibly the Malay Archipelago. The form *li-mung* is phonetically too simple, and its congeners of almost identical structure are too widely diffused to afford a clue as to the particular nation or country from which the southern Chinese might have derived the fruit. One fact stands out clearly, and this is that *li-mung,* unlike numerous

[5] There is good reason to believe that this text has been pointed out here for the first time. It has remained unknown to the editors of the *T'u shu tsi ch'eng,* to the *Pen ts'ao kang mu shi i, Chi wu ming shi t'u k'ao, Ts'e yüan,* and the *Shanghai Botanical and Medical Dictionaries.* The *T'u shu tsi ch'eng* has devoted no article to the subject, being content to quote Fan Ch'eng-ta's definition of *li-mung tse* without any additional text and placing it among "miscellaneous fruit-trees" (XX, chap. 313, *tsa kwo mu pu hui k'ao,* p. 4) and again among "fruits" (XX, chap. 15, *kwo pu hui k'ao* 2, p. 10), in this case without citation of the source. Even J. Matsumura (*Shokubutsu-mei-i,* pt. 1, p. 86) cites the Chinese names for *Citrus limonia* merely from recent works such as *Ling nan tsa ki, Kwang-tung sin yü, Kwang k'ün fang p'u,* and *Hwa i k'ao,* but has neglected the *Ling wai tai ta.*

other Indic plant names, is not a bookish transcription based on Sanskrit, but was orally received together with the plant through an intermediate tongue from a mediaeval Indic vernacular. Sanskrit *nimbū* or *nimbūka* is probably based on the vernacular forms: Bengali *lebu, nebu*; Konkani *limbo, nimbo, nimbu*; Oriya *nembu*; Hindī *nībū, limbu, limu*; Panjabi *nimbu*; Marathi *nībū*; Gujarati *lību*; Nepali *nibu* or *nību,* Assamese *nemu.*[6] Old Javanese and Bali *limo*; Malay *limon, līmau, līmaw*; Dayak *liman;* Sunda and Makasar *lemo*; Nias *dima*; Formosa *rima.*

It should be emphasized right here that the Buddhists had nothing whatever to do with the propagation of the fruit or its name. Buddhist texts and lexicographical literature are reticent as to both, and the conclusion to be drawn from this and other facts inevitably is that at the time Buddhism was diffused from India to China the lemon was not yet cultivated in India. It is noteworthy also that the Chinese have never been aware of the fact that the lemon is a native of India; India is never referred to in connection with it. Only recently have they learned this fact from us. Both the *Ts'e yüan* and the *Shanghai Botanical Dictionary* (*Chi wu hio ta ts'e tien,* p. 516) point out that the lemon originally grows in India, but foolishly do not say a word about its cultivation in China. It is clear that this cultivation was firmly established in Kwang-tung Province in the second half of the twelfth century when Chou K'ü-fei wrote, for the fruit was then extensively used for culinary purposes at Canton. Neither at that nor at any later time do we hear of any importation of lemons into the country.[7]

[6] Mr. Edwin H. Tuttle has kindly favored me with the following note on the Dravidian names of the lemon: "I find Kanara *iliminci* 'lemon,' *nimbe* 'lime'; Tamil *elumiccai* 'lemon' or 'lime'; Telugu *nimma* 'lemon' or 'lime'; Tulu *nimbę, limbę, limbi* 'lemon.' Kanara regularly has *i* for *e* before *i* or *u*: *iliminci* comes from a form with initial *e*. Weak *i* and *u* interchange often in Tamil; *elu-* may come from **eli-*. Telugu regularly has *mm* for *mb*, and often *n* for *l* or *r* near a nasal. Kanara final *e*, Telugu final *a* and Tulu final *ę* (very open *e* or *æ*) probably represent *-as*. I think a basis **limbas* might be assumed for all of the words given above. Native initial *l* is unknown in Tamil and unsual in Kanara; *iliminci* and *elumiccai* may have come from Telugu **limma*; the ending looks like Sanskrit *icchaka*. Sanskrit *nimbū* may have come from Dravidian **limbūs*, which might be an older form of ***limbas.**"

[7] I have searched through the *Mong liang lu* (A. D. 1274) of Wu Tse-mu, the *Tung king mong hwa lu* of Mong Yüan-lao, and the *Wu lin kiu shi* of Chou

The *Ling nan tsa ki* 嶺南雜記, a record of the geography and productions of Kwang-tung Province, written by Wu Chen-fang 吳震方 in the seventeenth century (Wylie, *Notes,* p. 63), gives the following information (*Siao fang hu chai,* IX, p. 194; also in *Lung wei pi shu* and *Shwo ling*):

"The fruit *i-mu* 宜母 resembles the orange, but is sour. It is much used as a condiment to food. It improves the breath, and is grateful to the stomach. Women, who during the time of pregnancy feel uneasy, will be comfortable after eating this fruit. Hence it has received the name *i-mu* ('beneficial to the mother'). It is also called *i-mung-tse* 宜濛子. It is prepared in the form of a liquid sweet or sour, that dispels the heat (i. e. it is cooling) and that is styled *kie k'o shwi* 解渴水 ('thirst-allaying water,' i. e. lemonade). Wu Lai 吳萊 of the Yüan period is the author of a song entitled 'lemon hot water song' (i. e. a song in praise of hot lemonade)."[8]

The *Nan yüe pi ki* 南越筆記, written by Li Tiao-yüan 李調元 in the eighteenth century, contains the following text:[9] "The fruit *li-mung* 黎檬子 is also called *i-mu* 宜母. It resembles the orange (*ch'eng* 橙, *Citrus aurantium* L., now *Citrus sinensis* Osbeck), but is smaller in size. It ripens in the second or third month when it is yellow in color. It is exceedingly sour of taste. Pregnant women, when their liver is empty, have a craving for this fruit, whence its name *i-mu* ('beneficial to the mother'). At the time of the Yüan dynasty, Li-chi-wan 荔支灣 in Kwang-chou (Canton) was an imperial fruit orchard, where eight hundred large and small lemon-trees (*li-mu* 里木) had been planted for

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Mi in the hope of lighting upon the use of *li-mung tse* in the Hangchow of the Sung, but so far in vain. I am looking for further evidence before hazarding the conclusion that the lemon was unknown in central China under the Sung.

[8] Wu Lai, styled Yüan-ying 淵穎, lived during the thirteenth century. He is the author of the *Nan hai ku tsi ki* 南海古蹟記. His writings were collected under the title *Yüan-ying tsi* 淵穎集.

[9] The text in question is reprinted in the *Chi wu ming shi t'u k'ao,* sect. 果, chap. 16, p. 82. The *Pen ts'ao kang mu shi i* (chap. 7, p. 60b) ascribes the same text (with a few insignificant variants) to the *Yüe yü* 粤語. The *Nan yüe pi ki* is reprinted in the *Han-hai* collection and in *Siao fang hu chai,* IX (the above text on p. 277).

the purpose of making lemonade (*k'o shwi* 渴水).[10] The word *li-mu* designates the same fruit as *i-mu tse* 宜母子, also called *li-mung tse* 黎濛子. In the poem of Wu Lai it is said that the officials in charge of the gardens of Kwang-chou sent lemonade (*k'o shwi*) as tribute to the imperial court. When weather and wind are hot during the summer, a wine made from lemons and various flowers makes a 'sweet dew beverage' (*kan lu tsiang* 甘露漿).[11] In the countries [other reading: gardens] of the south they boil 'red dragon marrow' 赤龍髓[12] and cover this with lemons, squeezing the water out and boiling it with sugar. The Mongols call lemonade *she-li-pie* 舍里別 [a transcription of Arabic *sherbet*]. It is also styled 'medicinal fruit' (*yao kwo* 藥果). During the hot season people endeavor to buy lemons up for storage purposes; they keep for several years and still yield juice, which is a good substitute for vinegar."[13]

The *Hwa i hwa mu niao shou chen wan k'ao* 華夷花木鳥獸珍玩考 (chap. 10, p. 2) of 1581[14] contains a note of the

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[10] According to the *Kwang-tung sin yü* 廣東新語 (chap. 17, p. 12b), Li-chi-wan was the name of one of the famous gardens of Canton, situated five *li* west of the city.

[11] The term *kan lu* ("sweet dew") denotes (1) a heavenly dew as a symbol of universal peace (under the Han); (2) the nectar of the gods, rendering Skr. *amṛta*; (3) the manna furnished by *Hedysarum alhagi* and other manna-like substances (*Sino-Iranica*, pp. 343-350), hence also used as translation of the Biblical manna; (4) the tuber of *Stachys sieboldi*; (5) hard sugar (*Hwa i k'ao*, chap. 5, p. 29).

[12] I do not know what this vegetal substance is; it is not listed in any of the relevant sources.

[13] The *Yüe yü* contains a notice to the effect that lemons put in a brine keep for years and change their color to black; juice from such lemons can heal wounds and "fire resulting from cold phlegm" 寒痰火. The same clause is found in the *Kwang-tung sin yü* (chap. 25, p. 33), which for the rest offers the same text as the *Nan yüe pi ki*.

[14] The title means "Researches into the botany, zoology, and mineralogy (including some art crafts) of China and foreign countries." The various chapters are grouped under subtitles as they deal with plants, animals, or precious stones. This book, written by Shen Mou-kwan 慎懋官 whose preface and postscript are dated 1581, is a mine of curious information, although most data are quoted from earlier works. A copy of the original edition of this now very rare book is in the Library of Congress to which I am grateful for its loan. It is usually cited under the abbreviated title *Hwa i k'ao*. See also Wylie, *Notes on Chinese Lit.*, p. 168.

lemon under the heading *i-mu tse* and begins by saying that in an ancient record it is also called *li siang tse* 梨橡子. The first element of this compound means "pear"; the second refers to a species of oak (*Quercus bungeana* or *chinensis*). It is difficult to see how a combination of these two plant names could be used for designating the lemon tree. I believe that *siang* is an error for *yüan* 櫞 (above, note 2) and *li* ("pear") for 黎 used in *li-mung*. The text of the *Hwa i k'ao* then continues, "In shape the lemon is like a sweet orange, but in taste it is sour. In the third year of the period Ta-te 大德 (A. D. 1299) of the Yüan dynasty, the officials in charge of sugar manufacture in the Ts'üan-chou circuit [in Fu-kien] reported that they used lemons (*li-mu tse,* as above), by a process of boiling the juice, in the preparation of sherbet (*she-li-pie*), which is the Mongol word for lemonade (*k'o shwi* 渴水). Of course, all fruit juices can be prepared in this manner, but only the lemon is sour in flavor and remains unchangeable for a long time. The word *li-mu tse* is identical with *i-mu tse.* At the time of the Yüan there was to the east of the city of P'an-yü (Canton) a lotus pond called Nan Hai ('southern sea'), and to the west of the city there was Li-chi-wan, with an imperial fruit orchard, where eight hundred lemon trees of various sizes had been planted. In the seventh year of the period Ta-te (A. D. 1303) the tribute gift (of lemonade) came to an end. At present this garden is the dwelling-place of common people."

This text is given as a quotation from the *Kwang chou chi* 廣州志 ("Records of Canton"), not to be confounded with the two *Kwang chou ki* 記 listed by Bretschneider (*Bot. sin.,* pt. 1, No. 377).

The form *li-mu* 里木 of the Mongol period is obviously based on Persian *līmū* ليمو, Persian being the lingua franca of the Far East during that memorable epoch. This form is not registered in any of our dictionaries, not even by Palladius, nor in the *Ts'e yüan.* Solely the *Shanghai Botanical and Medical Dictionaries* list it as a synonym of *i-mu,* but without any reference to the source. It would be interesting to trace this *li-mu* in the *Yüan shi* and other historical sources concerning the Mongol period.

At the time of the Yüan dynasty *she-li-pie* (as above) or *she-li-pa* 舍里八 (Arabic *sharbat* or *sherbet*) was a beverage favorite with the Mongol emperors, who appointed a special official charged

with its preparation and called *she-li-pa-chi* (in Mongol probably *šarbači*). Mar Sergius, a Nestorian Christian, who founded a Nestorian church at Chen-kiang in A. D. 1281, was reputed, as were also his ancestors, for his ability to prepare sherbet, and the emperor bestowed upon him a diploma in form of a golden tablet, granting to him the privilege of specially applying himself to that occupation. In A. D. 1268 the emperor Kubilai ordered Mar Sergius to come to Peking post-haste, in order to present sherbet, and he received ample reward for this service. *She-li-pa* is defined as "a beverage made of fragrant fruits boiled in water and mixed with honey" in the Chinese text in question, a chronicle of Chen-kiang fu written in the period Chi-shun (A. D. 1330-32), and *she-li-pa-chi* as the name of an office. Mar Sergius was obliged to send annually to the court from Chen-kiang forty jars of sherbet prepared from the juices of grape, quince, and orange, as the beverage was believed to have curative power. In 1272 Mar Sergius, together with the minister Sai-tien-chi, traveled to Yün-nan Province; in 1275, to the provinces of Che-kiang and Fu-kien, always for the purpose of preparing sherbet (Palladius, "Traces of Christianity in China and Mongolia," *Chinese Recorder,* VI, 1875, pp. 108-110; Palladius identifies *she-li-pa* with the Persian *sherbet,* but the word is of Arabic origin; cf. also Moule and L. Giles, *T'oung Pao,* 1915, pp. 633-635, 647, 653).

It follows from the above texts of the *Hwa i k'ao* and *Nan yüe pi ki* that lemon is to be added to the fruits which entered into the making of sherbet under the Yüan and that the word *sherbet* was then used principally in the sense of lemonade. Lemons were likewise so used in the Near East. Peter Mundy (*Travels,* I, p. 63, Hakluyt Soc. ed.), in 1620, describes the Turkish sherbet as "a drink made of sugar, juice of lemons and water." Sir Thomas Herbert (about 1630) wrote, "Their liquor may perhaps better delight you; 'tis faire water, sugar, rose-water, and juyce of lemons mixt, called sherbets or zerbets, wholsome and potable." John Fryer (*New Account of East India and Persia,* III, pp. 137, 149), who traveled in the East from 1672 to 1681, writes with reference to Persia that "the usual drink is sherbet made of water, juice of lemmons, and ambergreece [ambergris]" and that "sherbets are made of almost all tart pleasing fruits as the juice of pomegranets, lemmons, citrons, oranges, prunellas."

A. Bergé (*Dict. persan-français,* p. 237) gives for شربت *sharbat* the meaning "limonade, sorbet." As is well known, the series *sharbat, sherbet, sharāb* represents the ancestor of our words *sherbet, syrup,* and *shrab* (Osmanli *shorbet* migrating into Italian as *sorbetto,* hence French *sorbet,* Spanish *sorbete,* Portuguese *sorvete*). In the same manner as we learned the use of water-ices from the Near East, the Chinese adopted it from Persians and Arabs, as witnessed by their word *she-li-pa* and the prominent role played by the Nestorians in this industry.[15] After the fall of the Yüan dynasty, the word *she-li-pa,* which perhaps never was popular, sank into oblivion, but the preparation and use of sherbets have persisted in China to this day. In Peking they are known as *shu t'ang* 暑湯 (lit. "heat beverages," i. e. beverages to ward off the heat, cooling beverages), and during the summer months are sold by hucksters in the streets (at least this was the case under the Manchu dynasty 1900-10 when I lived in Peking).

"Among summer drinks there is the *swan mei t'ang* 酸梅湯, a decoction of a certain kind of green plum obtained from the south, which is taken during the hot months with ice as a cooling pleasant drink. It is sold everywhere in the streets. The plum is mixed with sugar and made into a dry paste, and is so sold in the dry fruit shops. It is also mixed with some *kwei hwa* 桂花, the flowers of the *Osmanthus fragrans* of Loureiro" (J. Dudgeon, *The Beverages of the Chinese,* Tientsin, 1895, p. 17; see also W. Grube, *Zur Pekinger Volkskunde,* p. 76).

Matsumura cites also the name *lo-mung-tse* 羅蒙子 from the *Yang-ch'un hien chi* 陽春縣志 as a synonym of the lemon. In the *Ling wai tai ta,* however (chap. 8, p. 9b), *lo-mung-tse* (*lo* being written 蘿) is given as a distinct fruit, described as "being yellow,

[15] A strange confusion has been brought about by Hirth (*Chau Ju-kua,* pp. 115, 120, 121, 127) in regarding *se* 思 and *sha* 沙 as transcriptions of Arabic *sherbet.* Aside from the fact that this is phonetically impossible and that *she-li-pie* or *she-li-pa* are the correct transcriptions of the Arabic word, there is no question at all of sherbets in the text, but of "wines (i. e. alcoholic beverages) which are heating and stimulating." A sherbet is just the opposite, a non-alcoholic, cooled and cooling beverage. Peter Mundy says advisedly that sherbet is the ordinary drink of great men among the Turks, their law forbidding them wine. Ch'ang Te mentions orange juice mixed with sugar as the beverage of the caliph without giving the name sherbet (Bretschneider, *Med. Res.,* I, p. 140).

of the size of an orange or pumelo" 棖 柚 (the former character is identical with 橙).

The origin of the form *ning-mung* (or *meng*), as given by F. Porter Smith, Bretschneider, and others, remains obscure. As far as I have been able to ascertain by interrogating Chinese, it is chiefly used in Kwang-tung and Fu-kien, while Shanghai and Peking men prefer *li-mung*. There is to my knowledge no authority for the characters 檸 檬, as given by Bridgman, F. Porter Smith, and successors, although entered in all current dictionaries and even in the *Tsʻe yüan*. The *Shanghai Botanical Dictionary* (*Chi wu hio ta tsʻe tien*, p. 516) winds up its discourse on the lemon, which is poor enough (only the *Yüe yü* and *Ling nan tsa ki* are laid under contribution), by saying that "in recent times the lemon is generally called *ning-mung*" (same characters as those of F. Porter Smith). Kʻang-hi's Dictionary does not give them; above all, however, there is no literary source that gives them, and I have searched for them long and patiently. The only work in which I found them is one of recent origin, the *O yu ji ki* 俄遊日記 (*Diary of a Journey to Russia*) by Miu Yu-sun 繆祐孫 (*Siao fang hu chai*, III, p. 416).

The Chinese nomenclature of the lemon may now be tabulated as follows:

黎朦子 *li-mung* or *li-mong tse* (Sung).—*Kwei hai yü heng chi* and *Ling wai tai ta*.

里木 *li-mu* (Yüan).—*Hwa i kʻao, Nan yüe pi ki*.

黎檬子 *li-mung tse*.—*Nan yüe pi ki* and Kʻien-lung's *Polyglot Dictionary*, Appendix, chap. 3, p. 15b, with the following equivalents: Manchu *jušuči* (lit. "sour fruit"), Tibetan *li-meṅ* or *li-möṅ siu* (transcription of Chinese),[16] Mongol *küjiltäi jimin* ("aromatic fruit").

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[16] As to the acquaintance of the Tibetans with lemons, I have no personal experience. Jäschke, in his *Tibetan-English Dictionary*, cites *gam-bu-ra* ("citron, lemon") as West-Tibetan; in his *Tibetisches Handwörterbuch*, which preceded the English edition, he has added Sanskrit *gambhīra*, which according to Boehtlingk and Roth denotes "lemon-tree, lemon." Chandra Das, in his *Tibetan-English Dictionary*, copied Jäschke's *gam-bu-ra* and joined to it Sanskrit *jambīra*; *jambīra*, of course, could never be transformed into a Tibetan *gam-bu-ra*; it denotes not the lemon, but *Citrus medica*. Jäschke, further, gives "*spyod-pad, dpyod-pad* (spelling uncertain), pronounced *čö-pe*" as a designation of the lemon; this is quite enigmatic

宜 母 *i-mu,* by way of popular etymology with reference to an alleged medicinal virtue of the fruit.—*Ling nan tsa ki.*

宜 濛 子 *i-mung tse,* a compromise or missing link between the correct form *li-mung* and the popular *i-mu.*—*Ling nan tsa ki.*

舍 里 別 or 八 or *she-li-pie* or *pa,* sherbet, lemonade (Yüan).

解 渴 水 *kie* (*chieh*) *k'o shwi,* or merely *k'o shwi,* lemonade.—*Ling nan tsa ki, Nan yüe pi ki.*

ning-mung shwi or *li-mung shwi,* lemonade (modern colloquial).

The lemon is still cultivated in the provinces of Kwang-tung and Se-ch'wan. Mesny (above, p. ——) refers to its cultivation in western China. A. Hosie (*Report on the Province of Se-ch'wan,* 1904, p. 17) specifies the district of Kin-t'ang 金 堂 in the prefecture of Ch'eng-tu as the seat of lemon cultivation. Rockhill (*The Land of the Lamas,* p. 303) mentions a Catholic mission, near the famous Lu-ting suspension bridge in Se-ch'wan, where there was a fine vegetable garden around the vicarage, and he noticed in it pomelo and lemon trees laden with fruit, but he was told that it never matured. J. Anderson (*Report on the Expedition to Western Yün-nan,* 1871, p. 64) noted lemons at Bhamo. "The lemon is not grown in China as a fruit tree but only as a dwarf pot-plant, bearing as many fruits as can be got on it" (S. Couling, *Encycl. Sinica,* p. 410, after F. Meyer).

The "foreigner," who in the "introduction" of the lemon into China loomed so large in the minds of sinologists of the preceding generation that the Chinese sources were not even consulted, may have had his share in giving a fresh impetus to the cultivation of lemons in consequence of his greater demand for lemonade and lemon slices for tea, salads, and other dishes. The *Industrial Handbook of Kiangsu Province,* just issued by the Bureau of Foreign Trade (Shanghai, 1933, p. 220), contains the statement that "the import of lemons from the United States to Shanghai has increased from Haikwan Taels 96,523 in 1925 to H. Tls. 126,812 in 1928."

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to me. Lama D. Kazi (*English-Tibetan Dictionary*) lists *čos-pad* as a Sikkim word for the lemon. If the lemon is known to Tibetans, it must be due to importation from India, Kashmir, or Sikkim. According to Risley's *Gazetteer of Sikkim* (p. 76), the lemon is cultivated there.

II

After this reconnaissance I determined to follow the trail of the lemon in the Chinese records relative to the countries of the Indian Ocean, in the expectation of lighting upon data that might enable us to trace the gradual stages of its migration back to its native home, India. This attempt proved disappointing, however. Works such as the *Ying yai sheng lan,* the *Tung si yang k'ao* (of which I have the original edition of 1618), the *Si yang ch'ao kung tien lu* (in *Pie hia chai ts'ung shu*) do not mention the lemon anywhere. Those who have not access to the Chinese sources may convince themselves by consulting the relevant translations of Phillips, Mayers, Groeneveldt, Pelliot, and Rockhill. Nor is the lemon listed as an article of import into China; Chao Ju-kwa and others maintain silence about it. This, however, is surprising only at first sight, but considering the fact that everywhere in the Far East and in India the lemon is merely planted in gardens here and there for local needs and that it is nowhere cultivated on a large scale, this situation becomes easily intelligible. Only in southern France, Italy, Spain, Portugal, California, and the West Indies has lemon culture developed into an industry of such a magnitude that it pays exportation. The Chinese, being matter-of-fact people, in visiting foreign countries were interested to know, first, on what the inhabitants subsisted (the inquiry as to whether they cultivated rice and other cereals was uppermost in their minds) and, second, what agricultural and other products lent themselves to exportation. The lemon did not come within this category and therefore remained unnoticed.

In the Philippines the lemon was established long before the times of Spanish colonization. Pigafetta, who accompanied Magellan on his circumnavigation of the globe (1519-22) mentions lemons (*limoni*) among the fruits of the island Zubu or Cebu (Blair and Robertson, *The Philippine Islands,* XXXIII, pp. 133, 187, 231). Miguel de Loarca (*Relacion de las Yslas Filipinas,* 1582) reports, "There are also many good oranges and lemons" (*op. cit.,* V, p. 171); they are likewise referred to by Antonio de Morga (*Sucesos de las Islas Filipinas,* 1609; *op. cit.,* XVI, p. 87). This excludes the notion held by some scholars of the preceding generation that the Malayan words for the lemon are derived from the Portuguese (e. g. W. Joest, *Das Holontalo,* 1883, p. 74).

H. Kern, in a brief article entitled "Limoen" first published in 1897-98 (reprinted in his *Verspreide Geschriften,* XII, pp. 151-153), regards Skr. *nimbū* as a sanskritization of Hindustani *nimbū,* which on its part should be a corrupted pronunciation of *līmū.* He further points to Old Javanese *limo* occurring in the *Rāmāyaṇa,* developed from an older *limau,* and to the cognate words in other Malayan forms of speech. In Samoa, Fiji, and Mota there is a word *moli* meaning "orange," which according to Kern is the same word as *limo.* His conclusion is that Dutch *limoen* in its origin is a Malayo-Polynesian word which by way of Hindustan, Persia, and Arabia has found its way to Europe. This linguistic somersault is made without any regard to the botanical facts. If Kern's speculation were correct, the lemon tree would have to be regarded as a native of Malayo-Polynesia and as having been introduced from there to India. The reverse, however, is the case. According to G. Watt (*The Commercial Products of India,* 1908, p. 325), who calls the lemon *Citrus medica* L., var. *acida,* it is "undoubtedly a native of India." It grows wild in the forests of northern India, on the southern slopes of the Himalaya, especially in the valleys of Kumaon and Sikkim. In the valley of Nepal lemons grow most luxuriously and are of very fine flavor (*Imp. Gazetteer of India,* XIX, p. 47). How the plant spread from India to Malaysia we have no means of ascertaining; there are two possibilities—either by way of Indo-China or from southern India or Ceylon directly across the sea, possibly by both ways. A. de Candolle already emphasized the fact that nowhere in the Archipelago does the lemon occur in the wild state, but is only cultivated. The occurrence of the word *limo* in the Javanese version of the epic Rāmāyaṇa is merely an example of the application of the word in literature, but does not go to prove that the lemon was anciently known in Java, not to speak of cultivation; nor is it by any means certain that the word refers to our lemon (cf. W. Marsden, *History of Sumatra,* p. 100, where it follows from the names for various citrus fruits cited that *limau* is a general term covering all members of the Citrus family).

The task of elaborating a history of the lemon in India if such is possible must be left to competent Sanskrit scholars. The fact that it appears on the horizon of the Chinese as late as the twelfth century and that at about the same time it starts on its westward

migration leads me to think that the beginnings of its cultivation in India may fall in the early middle ages, say the fourth or fifth to the ninth century. The earliest reference to the lemon of India is made by the Arabic geographers of the tenth century (below, p. 158). It is significant that the Chinese Buddhist pilgrims to India, while they describe many plants of the country, are reticent as to the lemon and that it is not mentioned in Buddhist literature. It is not contained in the Bower Manuscript, but according to Watt in the work of Suśruta. The Petersburg Dictionary refers under *nimbū* to *Rājanighaṇṭu* (11,176) and *Bhāvaprakāśa* (2,38); the term *nimbūkaphalapānaka* goes to show that lemonade was known in India. François Bernier (*Travels in the Mogul Empire 1656-68*, transl. by A. Constable, 2d ed. by V. A. Smith, p. 253) refers to the excellent lemonade to which a wise man will here accustom himself and which costs little and may be drunk without injury.

The earliest references to lemons in India on the part of European travelers are by the two friars, Odoric of Pordenone and Jordanus. Odoric (1286-1331), on his visit to the island of Sillan (Ceylon), describes a pool full of precious stones and abounding in leeches. The king, he relates, allows the poor to search the water for the stones once or twice a year and to take whatever they can find. But that they may be able to enter the water in safety they bruise lemons and copiously anoint the whole body therewith, and after that when they dive into the water the leeches do not meddle with them (Yule, *Cathay,* 2d ed. by Cordier, II, pp. 171, 306, 347). As Yule annotates, Ibn Baṭūṭa writes that the people of Ceylon take care to keep ready a lemon and to squeeze its juice upon leeches that may drop upon them. Knox and Tennent corroborate Odoric's notice of lemon juice as the remedy for leech bites. Hence it is quite certain that the lemon is intended in Odoric's text and that the medicinal properties of lemon juice were anciently known in India. Another early mention of lemons in Ceylon is by Gabriel Quiroga de San Antonio (*Brève et véridique relation des événements du Cambodge,* ed. A. Cabaton, p. 178), who paid a visit to Ceylon in 1600. Friar Jordanus, in 1328, wrote that India, as regards fruit and other things is entirely different from Christendom, except that there be lemons in some places, as sweet as sugar, while there are other lemons sour like ours (Yule, *Hobson-Jobson,* p. 514).

It is said that the so-called Nabatean Agriculture, written in A. D. 903 by Ibn Wahshiyah (regarding this work see Carra de Vaux, *Les Penseurs de l'Islam,* II, pp. 296-300), contains an allusion to the lemon (Flückiger and Hanbury, *Pharmacographia,* 2d ed., 1879, p. 115, after Meyer, *Gesch. der Botanik,* III, p. 68). If this be true, it would be the earliest reference to the fruit in the literatures of the world. I note from E. Seidel (*Mechithar,* p. 216), however, that the word in the text thus translated is خسيا which Seidel regards justly as a transcription of Khasia, a district in India known for Citrus cultivation. This being the case, it is not certain that the lemon is intended; it may be one of the many other species of Citrus as well.

The geographers Iṣṭakhrī and Ibn Haukal (toward the middle of the tenth century) are the first Arabic authors who attribute to Sind a fruit as large as an apple and very sour, called *līmūnah.* This information has been copied by Edrīsi of Cordova and Abu'l-Feda (Guyard, *Géographie d'Aboulféda,* II, pt. 2, p. 113; A. von Kremer, *Culturgesch. des Orients unter den Chalifen,* I, p. 312). According to von Kremer, the migration of the lemon from India to the Near East took place under the caliphate. The Arabs apparently transmitted it to Persia, Iraq, Syria, and Egypt. In regard to Persia see, for instance, G. Le Strange, *Description of the Province of Fars in Persia,* pp. 39, 47. In Syria the lemon was cultivated under the Mamluks in the thirteenth century (Gaudefroy-Demombynes, *La Syrie à l'époque des Mamelouks d'après les auteurs arabes,* p. 26).

Ibn al-Baiṭār of Malaga (A. D. 1197-1248; Leclerc, *Traité des simples,* III, pp. 255-262) gives a lengthy description of the lemon, its properties and uses, and it is noteworthy that he does not cite, as in most cases, his predecessors; but he evidently describes the plant and fruit from personal experience. He gives a recipe for the preparation of lemon syrup or lemonade as then was customary in Egypt: three or four ounces of lemon juice were mixed with a pound of sugar; this mass was heated, and water was added to it according to individual taste. Lemons are frequently mentioned in the Arabian Nights, and lemon trees in a garden of Egypt are described poetically in the story of Nūr ed-Dīn and Maryam (Night 846). In Morocco lemons were known in the fourteenth century,

according to Ibn Faḍl Allah al-ʿOmarī, 1301-49 (*Masālik el Absār* etc., transl. by Gaudefroy-Demombynes I, 1927, p. 175).

Documentary evidence as to how and when the lemon was introduced from the Near East into southern Europe is lacking. It is supposed that the Crusaders took it along from Palestine and that the Arabs transmitted it to Spain. The former supposition is based on the fact that Jacobus de Vitriaco (or Jacques de Vitry, about 1200) describes the lemon which he had seen in Palestine, but he does not say that he was instrumental in taking it to Europe.

Ibn el-ʿAwam, who lived at Seville in the twelfth century (Clément-Mullet, *Le Livre de l'agriculture,* 1864, I, p. 300), in his great work *Kitāb-el-felāhah,* mentions the lemon or citron tree (*limonier ou citronnier* in Mullet's translation), but does not say that it was cultivated in the Spain of his time, nor does he refer to lemonade; the chances are that the lemon is not visualized in his text. Perhaps it was to Sicily and southern Italy that the lemon was first transplanted through Arab agency. The fact of the transmission itself cannot be called into doubt, for it is upheld by the migration of the Arabic word *limūn, leimūn* ليمون into Italian *lima, limone* (Old Italian *lumia, lomia*); Spanish *lima, limon*; Portuguese *lime, limão*; Provençal and French *limon*; Rumanian *lemej, alemej, alimon.* The early English travelers to India also have preserved the vowel *i*: thus William Finch (in India 1608-11) spells *limmons,* Edward Terry (in India 1616-19) *limons* (see W. Foster, *Early Travels in India,* pp. 166, 297).

By the sixteenth century lemon culture was well established in Italy. Castore Durante (*Herbario nuovo,* Roma, 1585, p. 259) writes that lemons grow in great quantity in Calabria, in Puglia, and in the kingdom of Naples and are found in many gardens in Rome and neighboring places. From Italy lemons became known in Germany in the first half of the sixteenth century, and then and in the seventeenth century were still called *limone, lemone,* subsequently superseded by *citrone.* Around 1700 Germans became acquainted with lemonade (Kluge, *Etymol. Wörterbuch*). From about 1630 the *limonadiers* began to play a prominent role in France, subsequently taken over by the cafétiers—a subject treated in detail by Larousse (Grand Dictionnaire).

In England lemon trees were cultivated as early as the reign of James I (1603-25) as Lord Bacon mentions lemons, oranges, and

myrtles housed in hot country plants. In some parts of Devonshire lemon trees were trained to the walls, requiring no other care than to be covered with straw or mats during the winter. Being of a much hardier nature than the orange, the lemon was brought to greater perfection in England than the latter fruit (H. Phillips, *Pomarium Britannicum,* p. 229).

During the seventeenth century the lemon had completed its triumphal procession around the world. The great traveler Peter Mundy, in 1634 and 1638, found lemons in St. Helena, where there was a "Lemmon Valley because it leads to the place where lemmon trees are" (*Travels in Europe and Asia,* III, pp. 330, 412, Hakluyt Soc. ed.). Although St. Helena never had a native population, it has played a great role in the diffusion of cultivated plants. H. Phillips (*op. cit.,* p. 230) wrote in 1821 that "the lemons of St. Helena are the most esteemed, growing larger, and of a milder flavor than other kinds." In 1613 Rodrigues da Costa found citrons and lemons in Madagascar (*Collection des ouvrages anciens concernant Madagascar,* II, p. 12). Sir Thomas Roe (*Embassy to India 1615-19,* ed. W. Foster, pp. 9, 13) reported lemons on the Comoro Islands. In 1638 Mundy encountered lemons in Mauritius, Madagascar, and Mohilla, one of the Comoro group (II, pp. 14, 319; III, pp. 350, 369). On the island of Bourbon (then Mascaregne) lemons were observed by the Sieur D. B. (P. Oliver, *Voyages made by the Sieur D. B. 1669-72,* p. 86). On the east coast of Africa lemons were known much earlier: Ibn Baṭūṭa mentions lemon trees on the island Manbasa, two days' voyage from the land of the Swahili (Defrémery and Sanguinetti, *Voyages d'Ibn Batoutah,* II, p. 191).

The Introduction and Use of Eastern Drugs in the Early Middle Ages*

By JOHN M. RIDDLE

Medical recipes are scattered in numerous manuscripts both in Latin and the vernacular. Many date from the so-called „dark ages", that is, pre-Salernitan Europe before the first translations of the Islamic medical writings[1]. Examination of the nature and sources of this early medieval recipe literature has disclosed an interesting connection with eastern drugs. The importance of this connection is grasped when we note that the large amounts of oriental products mentioned in western texts indicates both extensive trade contact and a type of communication about new drugs. This development comes prior to any known translations of medical texts and when, according to the old PIRENNE thesis, Europe was introverted and isolated from contact with the Islamic east.

Before launching this study it might be wise to make some introductory comments about the nature and content of the medieval recipe literature. Few existing manuscripts are completely devoted to the antidotaries and receptaries, words used to describe the Latin recipe literature, although numerous medical and non-medical manuscripts contain folios of prescriptions for all sorts of afflictions[2]. The authorship is always anonymous. SIGERIST and JÖRIMANN agreed that the antidotaries were compiled by monks having some medical knowledge[3]. Most recipes are derived directly out of the

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[1] In the last century the Rev. THOMAS OSWALD COCKAYNE published an extensive collection of the Anglo-Saxon recipe literature (*Leechdoms, wortcunning, and starcraft of early England*, re-issue 3 vols. [London 1961].) which has been subsequently re-examined in book form by J. H. GRATTAN and CHARLES SINGER (*Anglo-Saxon magic and medicine* [London 1952]) and, still more recently, by WILFRID BONSER (*The medical background of Anglo-Saxon England. A study in history, psychology, and folklore* [London 1963]). Early in this century HENRY SIGERIST (*Studien und Texte zur frühmittelalterlichen Rezeptliteratur* [Leipzig 1923]) and his pupil JULIUS JÖRIMANN (*Frühmittelalterliche Rezeptarien* [Zürich 1925]) published the texts of some of the early Latin recipe literature.

[2] LOREN C. MACKINNEY, *Early medieval medicine: with special reference to France and Chartres* (Baltimore 1937), p. 136.

[3] SIGERIST, *Rezeptliteratur*, p. 168; JÖRIMANN, *Rezeptarien*, p. 1.

works ancient authors, especially ALEXANDER OF TRALLES, AETIUS OF AMIDA, and PAUL OF AEGINA, but not two antidotary or receptary are alike. Individuality and originality are present in so far as the compiler had to make the selection himself from the plentiful supply of prescriptions in ancient texts and, therewith, came personal judgment[1]. GALEN was the most named author, HIPPOCRATES being in the background, but many classical names were attached to the prescriptions. Some have emperors' names, *e. g.*, VESPASIAN and ALEXANDER OF MACEDONIA, and other writers of the early middle ages, *e. g.*, AFRODISIUS, THOMAS, GENTILIS, NEUCLERIUS, and EUGENIUS[2]. There is evidence that new material was translated from the Greek[3]. Still some recipes cannot be attributed to extant classical works, and it is certain there were new additions. What we have in most cases are original compilations, SIGERIST said, which the writer has gathered for the necessity of his monastic needs[4].

For the most part the recipes pertain to things of everyday life, *e. g.*, remedies for coughing and removing lice, and for headaches, pain in the stomach, and wounds. Most recipes are not for specific diseases. Early medieval medicine was unprepared for advanced diagnostic techniques required for such prescriptions. The recipes were mostly for what today would be called patent medicines purchased across counters[5].

Recipe literature is found in Anglo-Saxon England and written in the old English vernacular. These numerous manuscripts, mostly pre-Salernitan, are not translations but compilations by herbalists (leeches) mainly from Latin sources but with unusual amounts of folklore sprinkled throughout. The folklore is derived from Roman, Celtic, and Teutonic cultural strands. Additionally these leechbooks show evidence of southern Italian and Byzantine influence, chiefly via Benedictine transmission[6].

In attempting to obtain an insight into the extensiveness of drugs in early medieval, western pharmacopoeia, I took a statistical analysis of the 9th century antidotary, St. Gall MS 44, ff. 228–255[7]. The manuscript is divided into sections according to the form of the

[1] SIGERIST, *Rezeptliteratur*, pp. 185–6; JÖRIMANN, *Rezeptarien*, pp. 1–2.

[2] SIGERIST, *Rezeptliteratur*, pp. 182–4.

[3] *Ibid.*, p. 186. [4] *Ibid.*, pp. 185–6. [5] *Ibid.*, p. 170.

[6] CHARLES SINGER, „Introduction", to COCKAYNE, *Leechdoms* . . ., I, xxvi–xl; BONSER, *The medical background of A. S. Engl.*, pp. 34–47.

[7] The text is published in SIGERIST, *Rezeptliteratur*, pp. 78–99.

recipe, *e. g.*, salves, poultices, and the like. This antidotary has a total of 123 recipes involving some 361 different ingredients used a total of 944 times, thereby, illustrating at once the large number of drugs. Since the drugs were not often repeated, just a few accounting for the majority, we can see the specialized nature attributed to each simple. In our analysis we eliminated honey, wine, wax, and rose water, substances used as emollients, flavoring agents, and solvents. From a list made of the substances, the following are those appearing in eight or more recipes (The number of times per recipe is in parenthesis): *aloes* (15), *ammonicum* (11), *amomum* (9), *apium semen* (10), *cassia* (12), *ciminum* (8), *colofonia* (14), *fenuogrecum* (10), *libanus* (12), *linum* (11), *mastice* (16), *murra* (17), *piper* [white, long, and black] (33), *petroselinum* (17), *picea* (10), *scamonia* (14), *storace* (13), *terebentina* (17), *and zinzibar* (8).

An examination of the identities of these drugs reveals a startling fact: *most can only be found in the orient.* Eastern drugs seemed to have been the ,,miracle drugs" of the Age[1]. Though it is impossible always to identify each according to the exact plant species, one can be fairly certain of the family or, at least, genus[2].

Amomum is an aromatic scrub said by PLINY to come from India, Persia, and the Aral Sea region and presently attributed to Persia and the Aral Sea region[3]. *Ammonicum*, a salt, is ammonium chloride and apparently associated in antiquity with the oracle Hammon in the desert regions of Africa where *ammonicum* is found. Both PLINY and GALEN note its use in early medicine[4], but it is known to have been manufactured in the late middle ages from the

[1] I roughly define *eastern* as those regions either controlled by Islam or east of it and excluding Spain. This includes northeastern Africa.

[2] The confusion over nomenclature, plant identities, and taxonomic categories in ancient-medieval medicine is illustrated in an excellent study by JERRY STANNARD, ,,The plant called moly", *Osiris*, 14 (1962), 254–307.

[3] PLINY, *Natural History* 12. 28. 49–9; HEINRICH ZÖRNIG, *Arzneidrogen. Als Nachschlagebuch für den Gebrauch der Apotheker, Ärzte, Veterinärärzte, Drogisten und Studierenden der Pharmazie*, 2 vols. (Leipzig 1909), I, 7. Of course, seeds scatter and species are unable to survive in some regions. This causes differences in the distribution of plants between ancient and modern times, but I shall assume in this study that plants, presently found only in the warm, moist climate of southern Asia were there also in antiquity. In most cases, I have been able to cite ancient sources collaborating modern botanists.

[4] PLINY, *N. H.* 31. 39. 78–9; GALEN, *Opera*, K. XIX, 724, 734.

distillation of the horns and hoofs of oxen[1]. *Aloes*, employed extensively in ancient medicine, is found in south Africa but mostly in India where there exists a variety of species[2]. Medicinal aloes is a resin described in the *Materia Medica* of DIOSCORIDES[3]. *Cassia*, probably a product of *cinnamomum pauciflorum nees*[4], is said by PLINY to be the „skin" of a scrub[5], and it is known to be found only in the far east[6]. *Crocus* is simply the Latin and Greek form for saffron, an oriental product[7]. *Libanus*, or frankincense, is a product of the orient, though one variety of the tree bearing this gum is indigenous to the Somilia region[8]. *Murra*, or myrrh, remembered along with frankincense as two of the Magi's gifts, is the gum resin product of *commiphera myrrha*, found only in Arabia and Abyssinia[9]. On the other hand, *mastice* or mastic, a resinous exudation obtained from the lentisk plant, is presently grown in the entire Mediterranean area though evidence shows that in antiquity and the middle ages it was imported from the eastern Mediterranean[10]. *Pepper*, of course, is a product of the far east, a fact widely recognized in antiquity[11]. Derived from the plant *convolvulus scam-*

[1] LUDWIG FREDERICK AUDRIETH, „Ammonia", *Encyclopaedia Britannica* (1962 ed.), I, 815.

[2] ZÖRNIG, *Arzneidrogen*, I, 1–7; ALEXANDER TSCHIRCH, ed., *Handbuch der Pharmakognosie*, 3 vols. (Leipzig 1910), I, pt. 2, 1420ff.; 2nd ed.

[3] *M. M.* 3. 22 (WELLMANN, ed.); see also ISIDORE. *Ety.* 17. 8, 9, 28; and GRATTAN AND SINGER, *A.-S. magic and med.*, pp. 97–8. TSCHIRCH (*Pharmakognosie*, II, pt. 2, 1441) reports that aloes was mentioned in a letter between the PATRIARCH HELIAS of Jerusalem and ALFRED THE GREAT of England.

[4] GEORG DRAGENDORFF, *Die Heilpflanzen der verschiedenen Völker und Zeiten* (Stuttgart 1898), p. 239; TSCHIRCH, *Pharmakognosie*, II, pt. 2, 1261ff.

[5] PLINY, *N. H.* 12. 43. 95–8.

[6] DRAGENDORFF, *Die Heilpflanzen*, p. 239.

[7] ZÖRNIG, *Arzneidrogen*, I, 97; DRAGENDORFF, *Die Heilpflanzen*, p. 139.

[8] DRAGENDORFF, *Die Heilpflanzen*, p. 366; *Enc. Brit.*, (1962 ed.), IX, 689. The word *libanus* is derived from the Greek form, but also the Latin word for frankincense, *thus*, is found twice in this same manuscript. For ancient authorities, see PLINY, *H. N.* 12. 30. 51–65; 20. 64. 172; and THEOPHRASTUS, *On Plants* 9. 4. 4–9.

[9] DRAGENDORFF, *Die Heilpflanzen*, pp. 367–8; see also PLINY, *N. H.* 12. 30. 71, and THEOPHRASTUS, *On plants* 9. 4. 1–10.

[10] DRAGENDORFF, *Die Heilpflanzen*, p. 396; *Enc. Brit.* (1962 ed.), XV, 44; W. HEYD, *Histoire du Commerce du Levant au Moyen-Age*, 2 vols. (Amsterdam 1959), II, 633–5.

[11] See below, p. 192; also HEYD, *Histoire du Commerce . . .*, II, 658–64; and PLINY, *N. H.* 12. 14. 26–29.

monia, scammony is found only in the eastern Mediterranean area especially Asia Minor[1]. *Storace* or storax, widely employed in ancient medicine, comes from Asia Minor, Syria, and the far east[2]. Described by many ancient writers, *zinziber* or ginger is a native to the warm parts of Asia[3]. The remaining substances, *apium semen* (parsley seeds), *colofonia* (a resin product), *ciminum*[4], *fenogrecum* (or *fenum Grecum*, a plant), *linum* (flax), *petroselinum* (rock-parsley), *picea* (various forms of pitch), and *terebentina* (terebinth) are all found in western Europe. Thus, the evidence from this typical antidotary of 9th century Europe discloses a large use of eastern products which had to have been imported. That is to say, the drugs WERE imported if the manuscripts of recipe literature were in actual use.

Convincing evidence can be shown to those who with laudable stubbornness refuse to believe that the recipe literature was anything but handwriting exercises for monks with no medical knowledge. FULBERT wrote a letter to a bishop urging him to consult the antidotaries for proper medicines[5]. ALCUIN states that physicians (*medici*) collected and compounded drugs[6]. Prescribed ceremonies were probably performed while collecting herbs[7]. Intermittently medieval writers have appended their own observations onto

[1] DRAGENDORFF, *Die Heilpflanzen*, p. 553; TSCHIRCH, *Pharmakognosie*, II, pt. 2, 1333–5.

[2] DRAGENDORFF, *Die Heilpflanzen*, pp. 270–1; PLINY, *N. H.* 12. 55. 124–5.

[3] DRAGENDORFF, *Die Heilpflanzen*, p. 141ff.; *Enc. Brit.* (1962 ed.), X, 365; TSCHIRCH, *Pharmakognosie*, II, pt. 2, 1044–58. See also PLINY, *N. H.* 12. 14. 28; CELSUS, *De re medica* 5. 23; GALEN, *Opera*, XI, 880ff.; DIOSCORIDES, *M. M.* 2. 160 (WELLMANN, ed.). For trade in ginger, see HEYD, *Histoire du Commerce . . .*, II, 619–23.

[4] Though the plant is said to be found in modern, southern Europe as well as Egypt and Asia, PLINY spoke only of a species from Ethiopia. (Pliny, *N. H.* 20. 55. 161; DRAGENDORFF, *Die Heilpflanzen*, pp. 499–500) We know, however, that in the year 820 A. D. *ciminum* was growing in the herbal garden at St. Gall. — P. JUNG, „Das Infirmarium im Bauriß des Klosters von St. Gallen vom Jahre 820", *Gesnerus* 6 (1949), 5. There is some evidence that it may have been imported also. — see the list on p. 194.

[5] *Ep.* 4 (*P. L.*, *lat.*, CXLI, 195–6).

[6] *Ep.* 213 (*M. G. H.*, *Ep.* IV, 356–7): „Solent namque medici ex multorum speciebus pigmentorum in salutem poscentis quoddam medicamenti conponere genus, nec se ipsos frateri praesumunt creatores herbarum vel aliarum specierum, ex quarum conpositione salus efficitur egrotantium . . . ".

[7] BONSER, *The medical background of A.-S. Engl.*, p. 314–6.

ancient texts to clarify plant identities and to add where they are to be found[1]. As a final proof of the use of the recipe literature and of eastern products in them, the manuscripts contain new drugs recently discovered in the east. These new drugs were unknown in antiquity and were actually introduced into western Europe during the early middle ages. For example, the St. Gall MS 44 on folio 247 contains the word *ambar*, from the Arabic meaning ambergris, the biliary concretion of the sperm whale.

Unknown in antiquity, the pharmaceutical values of ambergris were discovered by the Arabs, though possibly they borrowed it from other eastern sources[2]. ABU ZAKARIYA IBN MASAWAIH (777–857 A.D.), the last great physician of the school at Jundišapur, named ambergris as one of the five principal aromatics[3]. A manual for traders, composed possibly in the 11th century or even earlier, lists ambergris along with camphor, musk, aloes, pepper, cinnamon, and ginger[4]. By the 12th century ambergris was confused with amber in western Europe. Thus, the knowledge of ambergris and its Arabic name were introduced into western Europe by the 9th century or two centuries before the first Latin translations of Islamic medical writers.

The word *cafora*, coming from the Arabic *kâfoûr*[5], is found in the same manuscript as ambergris and also in an antidotary written in Lombardic script in the 9th or 10th centuries[6]. As a product of the plant *cinnamomum camphora nees*, *cafora* or camphor is found

[1] JÖRIMANN, *Rezeptarien*, p. 81; MACKINNEY, *Early medieval med.*, pp. 35–6.

[2] JOHN M. RIDDLE, „Pomum ambrae: Amber and ambergris in plague remedies", *Sudhoffs Archiv*, 48 (1964), 121–2; and „Amber in antiquity: Philological variants", *Laudatores temporis acti. Studies in memory of Wallace Everett Caldwell* (Chapel Hill 1964), pp. 110–20.

[3] MARTIN LEVEY, „Ibn Masawaih and his treatise on simple aromatic substances", *Journ. hist. med.* 16 (*1961*), 394.

[4] *Kitāb al-ishārati ilà mahāsini 't-tjāra* (Cairo A. H. 1318), as cited by T. W. ARNOLD, „Arab travellers and merchants, A. D. 1000–1500", Chapt. 5 of: ARTHUR PERCIVAL NEWTON, *Travel and travellers of the middle ages* (New York 1926), 93–4 [The word *amber* is mistranslated].

[5] TSCHIRCH, *Pharmakognosie*, I, pt. 2, 611ff. Camphor is included in a list of drugs introduced by the Arabs and Persians by both TSCHIRCH (*Ibid.*, I, pt. 2, 614) and ERIC JOHN HOLMYARD („Medieval Arabic pharmacology", *Proceedings Royal Soc. Med.* 29 (1936), 107.

[6] Glasgow, Hunterian MS T. 4. 13, f. 168, as published in SIGERIST, *Rezeptliteratur*, p. 147.

only in the orient[1]. The Arabs discovered camphor in the booty taken in the Persian Sassanides capital[2]. IBN MASAWAIH classified it as a principal aromatic[3]. Unknown in antiquity[4], camphor is mentioned in the early 7th century and subsequently its use became widespread in the middle ages[5]. According to ALEXANDER TSCHIRCH, SIMON SETH (11th c.) was the first to mention camphor in Greek[6]. Like ambergris, camphor was first known in pre-Salernitan Europe.

An Anglo-Saxon monk, living in the 9th century, compiled a series of recipes which we now call the *Lacnunga*. It contains three prescriptions with the word *zedoary*[7]. The word recurs in the Glasgow MS T. 4. 13 of the 9th or 10th centuries[8]. Zedaory, from the Arabic *zedwar*, is an aromatic root of a species of tumeris (*curmuma zedoaria*) found in the orient[9] and completely unknown to the ancients[10]. HILDEGARD (fl. 1099) mentions it[11]. According to

[1] DRAGENDORFF, *Die Heilpflanzen*, pp. 240–1; ZÖRNIG, *Arzneidrogen*, I, 35; TSCHIRCH, *Pharmokognosie*, II, pt. 2, 1110ff.; *Enc. Brit.* (1962 ed.), IV, 679–80.

[2] HEYD, *Histoire du commerce . . .*, II, 590.

[3] LEVEY, „Ibn Masawaih", *Journ. hist. med.* 16 (1961), 394.

[4] The word ἡ καφουρά is found in GALEN, *Opera*, XIV, 761 and AETIUS OF AMIDA, *Libri medicinales* 12. 63, 16. 130. Even though accepted as legitimate by ZÖRNIG (*Arzneidrogen*, I, 35), the Arabic term *kâfoûr* is considered by modern scholarship to be interpolations whenever found in classical MSS texts. See LIDDELL and SCOTT, *Greek-English Lexicon* (9th ed.).

[5] ALBERICO BENEDICENTI, *Malati-Medici e Farmacisti.* 2nd. Ed. (Milan 1947), I, 285, 295ff.

[6] *Pharmakognosie*, I, pt. 2, 593–4.

[7] *Lacnunga*, London, MS Harley 585, ff. 137b, 138b, 142a, as published in GRATTAN and SINGER, *A.-S. magic and med.*, pp. 108, 110, 114.

[8] SIGERIST, *Rezeptliteratur*, p. 164.

[9] DRAGENDORFF, *Die Heilpflanzen*, p. 143; HEYD, *Histoire du commerce*... II, 676; ZÖRNIG, *Arzneidrogen*, I, 558; TSCHIRCH, *Pharmakognosie*, II, pt. 2, 1058–63.

[10] ZÖRNIG (*Arzneidrogen*, I, 558) says the word is found in the works of AETIUS OF AMIDA and PAUL OF AEGINA. I have been unable to find the substance in any works currently attributed to these authors. DRAGENDORFF (*Die Heilpflanzen*, p. 143) states: „Wird von neuern griechischen Autoren als Zerumbed benannt, ist aber nicht der Zedoar des Aetius oder Macer Floridus". The Latin translation of Aetius made by JANUS CORNARIUS (Bale 1533–5) has: „Zedor id est zeduarie . . .". In a letter published as a preface to the 1535 edition („Epistolae ad Carolum V"), Cornarius clearly asserts that a good medical man will use his knowledge of Arabic pharmaceuticals when the Greek interpretation is unclear. Although I am not certain, I suspect that ZÖRNIG was using the old FRANCIS ADAM's edition

GRATTAN and SINGER, zedoary along with *gallenger* are probably the earliest Arabic words traceable in old English[1]. *Gallenger*, or galingale, is another oriental, aromatic plant, again unknown in antiquity, but found in the recipe literature in both Latin and old English, dating from a least the 9th century[2].

Generally throughout the early medieval recipe literature other products of eastern origin are scattered in countless prescriptions. Pepper was the most widely used substance[3]. Musk, a product of Tibet and China, is found repeatedly as are *galbanum*, *costus*, *balsam*, *cardamomum*, all eastern products[4]. Such items as myrrh, gariofilum, ginger, storax, aloes, opium, cinnamon, frankincense, mastic, and saffron are often found in the recipes[5].

(London 1844) of PAUL OF AEGINA, an edition known to accept many interpolations as Paul's own writing. I have been unable to find zedoary in such standard authors as PLINY, ISIDORE, THEODORE PRISCIAN, MARCELLUS, and GALEN. See also, J. H. BAXTER and CHARLES JOHNSON, *Medieval Latin word-list* (Oxford 1934), p. 61, and DUCANGE, *Glossarium*, VIII, 428, for their entries on *zedoary*. TSCHIRCH (*Pharmakognosie*, I, pt. 2, 614, 1063) includes zedoary in his list of substances introduced by the Arabs and Persians.

[11] *Physica* 1. 14 (*P. L.*, CXCVII, 1127).

[1] *A.-S. magic and med.*, p. 108.

[2] *Galanga* is found in Karlsruhe, Bibliothek, MS Augiensis CXX, 9th or 10th c., f. 10v (SIGERIST, *Rezeptliteratur*, p. 54); Glasgow, Hunterian T. 4. 13, 9th or 10th c., f. 169 (*Ibid.*, p. 150); Cambridge, MS G. g. V. 35, 11th c., f. 429 (*Ibid.*, p. 163); London, B. M. MS Harley, 9th c., f. 138b (GRATTAN AND SINGER, *A.-S. magic and med.*, p. 110). See also ZÖRNIG, *Arzneidrogen*, I, 517; HEYD, *Histoire du commerce . . .*, II, 616–8; DRAGENDORFF, *Die Heilpflanzen*, p. 144; TSCHIRCH, *Pharmakognosie*, II, pt. 2, 1063–71.

[3] In the leechbooks published by COCKAYNE (*Leechdomms . . .*, 3 vols.), I have found the use of pepper seventy-two times. SIGERIST'S *Rezeptliteratur* and JÖRIMANNS *Rezeptarien* contain an equal abundance of usage. See a discussion on pepper in ALDHELM, *Aenigmatum* 3. 5. (*P. L.*, LXXXIX, 188).

[4] I shall cite only the references in the old English leechbooks (COCKAYNE, *Leechdomms . . .*) because they are not indexed as are the texts published by SIGERIST and JÖRIMANN; *galbanum*, II, 44, 174; III, 88, 112, 124, 134; *balsam*, II, 28, 174, 288; III, 90; *costus*, II, 238, 276; III, 6, 70, 72. As items of trade, see HEYD, *Histoire du commerce . . .*, II, 610–8, 636–40, 601–2, For the habitats and origins of these products, see DRAGENDORFF, *Die Heilpflanzen*, 140–1, 144–6, 368–9, 495–6; TSCHIRCH, *Pharmakognosie*, II, pt. 2, 1010–1, 1071–84, 1156–62. It is most difficult to identify the exact substance meant by the Latin word *balsam*. See the various discussions in PLINY, *N. H.* 12. 25. 41, 29. 50, 54. 111, 56. 126–7.

[5] See the texts of COCKAYNE, *Leechdomms . . .*, 3 vols.; SIGERIST, *Rezeptliteratur*; and JÖRIMANN, *Rezeptarien*, BENEDICTUS CRISPUS (d. ca.

Generalizations about the pharmaceutical usage of these eastern drugs are next to impossible without treating each separately. A large number, however, are aromatic substances, which seemed to have received emphasis in Arabic medicine, a fact perhaps dating back to the time when the Nabatean Arabs, living along the famous „incense road", controlled much of the trade route between the Hellenistic-Roman world and India. Often these aromatics were used as stimulants for such things as syncope and chronic catarrh, as an antispasmodic and a „comforter" of stomachic and intestinal disorders, and as a remedy for various nervous afflictions. Aloes, for example, was often used as a cathartic[1]. Camphor is known to have mild antiseptic and anesthetic properties, but probably these qualities as such were not recognized by medieval medical men. Most of the substances so far mentioned are to be found in early 20th century pharmaceutical guides. Even though synthetic drugs have mostly replaced these natural products, pharmacy nonetheless attributes some beneficial physiological action to them. Surpri-

725), *Poematium medicum* (*P. L.*, LXXXIX, 369–74), mentions myrrh and cinnamon. The *Lacnunga* (GRATTAN and SINGER, *A.-S. magic and med.*) has prescriptions for aloes, pepper, myrrh, zedoary, galingale, ginger, storax, and incense.

The Arabic word *saffron*, which gradually replaced the Greco-Roman word *crocus*, meaning the same substance, is found in a late leechbook (COCKAYNE, *Leechdomms* . . ., 96), but this particular manuscript seems to be a translation or, at least, heavily influenced by an earlier Salernitan work (See SINGER, „Introduction", to COCKAYNE, *Leechdomms* . . ., xxiv.). HOLMYARD („Medieval Arabic Pharmacology", *Proc. Roy. Soc. Med.*, 29 [1936], 107) erred when he stated that *crocus* and *saffron* were introduced by the Arabs and Persians. According to ZÖRNIG (*Arzneidrogen*, I, 97), saffron is mentioned in the Papyrus Ebers. A. C. CROMBIE (*Augustine to Galileo, the history of science A. D. 400–1650* [London 1952], p. 21) was mistaken also when he stated that saffron was introduced from the Arabs. There can be no doubt that the Latin *crocus* and the Greek *κρόκος* is saffron. For example, see the entries in LEWIS and SHORT, *A Latin dictionary* (Oxford), and LIDDEL and SCOTT, *A Greek-English lexicon* (9th ed., Oxford). I have systematically excluded *nard* from the accounts because, although the best probably comes from the orient, a Gallic *nard* exists.

[1] Other uses are to be found. For example, aloes was employed for diseases of the head in the *Secreta secretorum*, 1681 (*Early English Texts Society* [London 1894], extra series LXVI, 55), which was probably originally a Syriac work of the 7th, 8th, or 9th centuries and, subsequently, widely translated in the west. — GEORGE SARTON, *An introduction to the history of science*, I, 556–7.

singly often, however, the substances in the recipe literature are used in ways which modern pharmacy can see no value. For example, zedoary, a carminative, is employed in a prescription against elf-enchantment[1], and aloes, zedoary, and pepper, all aromatic condiments, were used for inflammation of the eyes[2]! It would be a mistake to attribute a high prestige to the recipe literature in light of modern pharmacology; but despite superstition, faulty theories, and semantic problems, the early middle ages had a working pharmacopoeia.

Since western pharmacopoeia included large numbers of eastern products, what then is the relation between pharmacy and trade during the early middle ages? Noting oriental products in the old English recipes, WILFRID BONSER posited that this did not necessarily mean that the products were imported to England because the recipes with these particular articles may have been copied from manuscripts in the south.[3] We know that the monks of Corbie in the 9th century planned to buy the following herbs and spices *at the market:* „piper, ciminum, gingember [ginger?], gariofile, cinamomum, galingan, reopontico, costus, spicum, mira, sanguinem draconis, indium, percrum, pomicar, zedoarium, styrax, calaminta, apparment, thyme, gotyumber, clove, sage, and mastick."[4] A similar but shorter list comes from Mainz in the 10th century.[5] These lists can be compared with the lists of herbs grown on the villas of CHARLES THE GREAT, in the monastic garden of St. Gall (820 A. D.), and in the private herbal garden of WALAFRID STRABO.[6] The existence of such lists points to the definite use of

[1] *Lacnunga*, London, B. M. MS Harley 585, f. 137b, as published in GRATTAN and SINGER, *A.-S. magic and med.*, p. 109ff.

[2] *Ibid.*, f. 142a, p. 115. This caused GRATTAN and SINGER (p. 115) to comment that they could not see how this prescription could fail to make the affliction worse. The use of aloes, saffron, pepper, myrrh, and camphor are found in prescriptions, mostly salves, for the eyes as recorded by IBN MASAWAIH. — C. PRÜFER and M. MEYERHOF, „Die Augenheilkunde des Johannia b. Masawaih", *Der Islam*, 6 (1916), 248ff.

[3] BONSER, *The medical background of A.-S. Engl.*, p. 45.

[4] This list is found in the appendix of B. GUÉRARD, *Polyptigue de l'abbé Irminon* . . . (Paris 1886), II, 336. For drawing attention to this list I am grateful to the late Professor LOREN C. MACKINNEY.

[5] A. SCHULTE, *Geschichte des mittelalterlichen Handels und Verkehrs zwischen Westdeutschland und Italien* (Leipzig 1907), I, 73.

[6] Capitulary *de villis*, lxx (*M. G. H., cap. regum Franc.*, I, 90): P. JUNG,

the recipe literature and the importation of eastern drugs. Before the 12th century at Westminister Abbey, the Chamberlain was charged with the duty of supplying medicine to the poor.[1] One recipe in a 9th century manuscript mentions that the drug cannot be found locally but had to be imported from the orient.[2] ALCUIN mentions a doctor *(medicus)* who delivered medicaments en route to Rome.[3] If the drugs were not imported into western Europe, what possible explanation can there be for the appearance of new drugs, such as ambergris, galingale, zedoary, and camphor, in the western recipe literature? Contrary to BONSER's doubts, the evidence is convincing that western Europe maintained continuous contact with the east in respect to pharmaceutical items. The business of the preservation of health was not likely to have declined so drastically as to have been bankrupted completely.

According to ROBERT LOPEZ, the spice trade between east and west never ended, as HENRI PIRENNE has postulated.[4] W. HEYD's study of east-west trade proves that the Arabs continued trading in far eastern products after the sweep of Islam. They found a good market for spices with the Germans.[5] Many of the products, *e.g.*, aloes, storax, and frankincense, were the same as are found in a 1st century B.C. (?) sailor's guide to trade in the Red Sea.[6] LOPEZ reports a Muslim traveler from Spain in 973 A.D. „was surprised at the quantity of ‚Indian' spices" he found in Mainz.[7]

„Das Infirmarium im Bauriß des Klosters von St. Gallen vom Jahre 820", *Gesnerus*, 6 (1949), 5; WALAFRID STRABO, *Hortulus* (*P. L.*, CXIV, 1119–50).

[1] NANCY JENKINS, „Medieval monastic accounts, medicines and spices", *The Pharmaceutical Journal*, 118 (1954, 4th ser.), 515.

[2] St. Gall MS 44, f. 242: „Emplastrum diauotanus utilis. Diatanos recipit haec: sinuitu albu orientale quia hic non inuenitur . . ." (SIGERIST, *Rezeptliteratur*, p. 84.) To be sure these words may have been copied from some ancient text but a reader in the middle ages would learn from them where the drug was to be found.

[3] *Ep.* 45 (*M. G. H.*, *ep.*, IV, 91): „Nam Basilius medicus, qui vobis in montanis, Romam pergenti, medicamenta tradidit, jam mortuus est." See also *Ep.* 77 (*M. G. H.*, *ep.* IV, 119) which mentions a „negociatorem, Italiae mercimonia ferentem . . .".

[4] ROBERT S. LOPEZ, „The trade of medieval Europe: the south", *The Cambridge economic history of Europe* (Cambridge 1952), II, 261.

[5] W. HEYD, *Histoire du commerce* . . ., I, 6ff., 17–8, 22, 89ff.

[6] *The periplus of the Erythraean Sea*. WILFRID H. SCHOFF, ed. (New York 1912) *passim*.

[7] LOPEZ, „The trade of med. Eur.", *Cam. econ. hist.*, II, 273.

The best illustration of trade in drugs is exemplified in the derivation of the word *apotheca* or apothecary. The Byzantines had local depots, called *ἀποθῆκαι*, in the main harbors and road termini of the Mediterranean area.[1] Just how or when the word changed from a general depot to a dispensory of drugs is unknown,[2] but some clues can be found. An edict of FREDERICK II, regulating medical activity, referred to *apotheca* apparently in the sense of a store house for drugs.[3] During the 13th century, at least, the word *apotheca* comes to have the specialized meaning of the modern word.[4] The very fact that the word for an import-export house came to be associated entirely with the meaning „drug-store" demonstrates vividly the relation between trade and drugs.

Placing its trust in faith, the early medieval church refused to turn its talents towards the field of medicine. Apparently the church looked mostly after its own clerics for physical cures. The well regulated profession of Roman medicine returned to the hands of the general people, the rustics.[5] Just as in all societies which lack sophisticated medical institutions, a semi-professional class rose to attend the needs of people in pain and sickness. These medical men are often practioners of a lower sort, such as, *harioli*, *leeches*, *midwives*, and the such. They were even consulted by ecclesiastics.[6]

[1] *Ibid.*, II, 275.

[2] HENRY ALAN SKINNER, *The origin of medical terms* (Baltimore 1949), p. 32; LUDWIG AUGUST KRAUS, *Kritisch-etymologisches medicinisches Lexikon* (Göttingen 1844), 115.

[3] WOLFGANG-HAGEN HEIN and KURT SAPPERT, *Die Medizinalordnung Friedrichs II.* (Veröffentl. d. Intern. Ges. f. Gesch. d. Pharmaz. N. F. 12, Eutin 1957), p. 51 (also see pp. 18–20): „Lucrabitur autem stationarius confectionibus suis secundum istum modum: de confectionibus vero et simplicibus medicinis, que ante non consueverunt teneri in apothecis ultra annum a tempore emptionis, pro qualibet uncia poterit et licebit tres tarenos lucrari. De aliis vero, que ex natura medicaminum vel ex alia causa ultra annum in apotheca tenentur, pro qualibet uncia sex tarenos lucrari licebit". (*Novae constitutiones, titulus* 46.)

[4] RUDOLF SCHMITZ, „Über deutsche Apotheken des 13. Jahrhunderts. Ein Beitrag zur Etymologie des apoteca-apotecarius-Begriffs", *Sudhoffs Archiv* 45 (1961), 290ff.

[5] MACKINNEY, *Early medieval med.*, pp. 68–9, 71, 79; BONSER, *The medical background of A.-S. Engl.*, p. 171ff.

[6] GRATTAN and SINGER (*A.-S. magic and med.*, p. 17, citing BEDE, *Life of St. Cuthbert*, 32–45; *Ecclesiastical history* 4. 32, 5. 2.) note that certain monasteries had resident leeches. GREGORY OF TOURS (De *miraculis Sancti Martini* 1. 26, cited by MACKINNEY, *Early medieval med.*, p. 71) refers to

In a certain sense it is not fair to say folkmedicine because a degree of training must have been required to enable the practitioner to use the recipe literature. Not every reader of the recipe literature would know every drug; in fact, maybe no one was familiar with every item. Still the practitioner had to have had a large knowledge of plant identities; and, because the amounts of the various ingredients are infrequently and poorly given, he had to have experience in the prescription manufacture.

By what process were new eastern drugs introduced to the west when „communication" was at a low ebb? The best explanation suggests that mysterious process, almost silent in our records, called folk-communication. Just as trade in amber and tin occurred from northern Europe to the Mediterranean area in pre-history, so also continued a trade in pharmaceuticals between the Islamic and Christian sides of the Mediterranean.[1]

The method of folk-communication is illustrated by a statement of MARCELLUS, a late Roman writer, who said he included in his works „even remedies chanced upon by rustics and the populace and simples which they have tested by experience."[2] ALEXANDER OF TRALLES confesses that he too borrowed prescriptions from rustics.[3] The spread of drugs from east to west is similar to the

harioli whom the general populace consulted about sorcery, potions, and *ligamenta*. GREGORY OF TOURS (MACKINNEY, *Early medieval med.*, p. 71, citing *Historia Francorum* 10. 25) „. . . vented his spite most bitterly on a miracle-working hermit who claimed to be Christ and who wandered about like a primitive medicine man with a mob of hysterical folk in his train."

[1] ALBERICO BENEDICENTI (*Malati-medici e farmacisti*, I, 308.) credits the period of 'ABD-AR RAHMAN II (d. 961) as the time when many oriental products, *e. g.* ginger, saffron, and myrrh, were introduced into Spain and, hence, into Europe. The evidence in the recipe literature pre-dates this more formal, cultural communication at court level. GRATTAN and SINGER (*A.-S. magic and med.*, p. 5) noted the appearance of the Arabic words *zedoary, gallenger*, and *ginger* (!) in the Anglo-Saxon prescriptions. They state that „. . . the advent of these in England was unrelated to the ‚Arabian' scholastic learning. They came with quite other cultural streams." They seem to suggest „hisperic elements", but it is not clearly seen, by me, at least, how this is related to medical practices. GRATTAN and SINGER were wrong, however, in thinking ginger is from the Arabic. Actually the word is probably derived from the Greek *ζιγγίβερι* (see GALEN, *Opera*, XI, 880ff.).

[2] *De medicamentis* 2 (p. 1, NIEDERMANN ed.): „. . . sed etiam ab agrestibus et plebeis remedia fortuita atque simplicia, quae experimentis probauerant, ..."

[3] *Opera*, II, 563 (PUSCHMANN ed.), as cited by LYNN THORNDIKE, *A history of magic and experimental science* (New York 1923), I, 578.

discovery of the stirrup in 5th century A.D. China and its introduction to the Franks in the 8th century.[1] Perhaps too much emphasis has been placed on medieval „reading" and „writing" and not enough on medieval „doing".

The medieval disbelief in sense perception, however, caused a failure to recognize that which was new. We find what today we would regard as medical practice mostly by semi-literate, medical men. Despite the authoritarianism in relation to ancient writings and the paucity of manuscriptions, we can catch glimpses of movement in the so-called „dark-ages" when it was previously believed all stood still. Significantly new eastern drugs were certainly introduced into western medicine before and separate from the intellectual recognition of the Islamic contributions to medicine. This necessarily implies not only a continued trade contact, contrary to the PIRENNE thesis, but a type of communication between Islam and Christianty over new discoveries.

Anschrift des Verfassers:

Dr. John M. Riddle, Medizinhistorisches Institut der Universität,
Bonn, Wilhelmsplatz 7

[1] LYNN WHITE, Jr., *Medieval technology and social change* (Oxford 1962), pp. 15, 27.

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Ancient and Medieval Chemotherapy for Cancer

*By John M. Riddle**

IN 1916 DR. WILLIAM S. STONE, who became the director for cancer research at New York Memorial Hospital, addressed his colleagues about cancer. Both his own and his father's generation, he explained, treated cancer mostly by surgery; chemical treatments had been virtually abandoned long before. His argument calling for reexamination of the issue was largely historical, based on the observation that classical and early medieval "treatment of the disease . . . almost invariably consist[ed] of arsenic, zinc, or the alkaline caustics." The historical testimony ought to be presumption, he implied, that chemical agents had some beneficial results, even though in his age there had been, in his words, "unqualified condemnation" of them.[1]

Stone's exhortation did not usher in a "second age of chemotherapy" for cancer, however. That age can perhaps be dated to 1938, when A. P. Dustin published his report about the antimitotic properties of colchicine, found in *Colchicum autumnale* L. C. Gordon Zubrod would date modern cancer chemotherapy to about 1935, with the investigation of the effect of bacterial toxins on human sarcomas. Others argue that the true beginning of modern cancer chemotherapy was in World War II, with the research on nitrogen mustards, but, because of security, the results were not published until after the war. Finally, a few note that the experiments by Paul Ehrlich in 1908 on transplantable tumors in rodents anticipated modern chemotherapy.[2] No one, however, disputes that

* Department of History, North Carolina State University, Raleigh, North Carolina, 27650.

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[1] W. S. Stone, "A Review of the History of Chemical Therapy in Cancer," *Medical Review,* 7 Oct. 1916, *90*:628–634, quoting pp. 628, 633.

[2] See A. P. Dustin, "Nouvelles applications des poisons caryoclassiques à la cancerologie," *Sang,* 1938, *12*:677–697, based on his earlier study on the mitotic changes induced by colchicine in a rat's Crocker sarcoma: Dustin, "Contribution à l'étude des poisons caryoclassiques sur les tumeurs animales . . . ," *Bulletin de l'Academie Royale de Médecine de Belgique,* 1934, *14*:487–502; on bacterial toxins, see C. Gordon Zubrod, "Origins and Development of Chemotherapy Research at the National Cancer Institute," *Cancer Treatment Reports,* 1984, *68*:9–19, on p. 9; on mustard gas, see Forest Ray Moulton, ed., *Approaches to Tumor Chemotherapy* (Washington, American Association for the Advancement of Science, 1947); and for Ehrlich see Paul Ehrlich, *Experimental Researches on Specific Therapeutics.* (Harben Lectures for 1907) (London: H. K. Lewis, 1908); and Vincent T. DeVita, Jr., "Principles of Chemotherapy," in *Cancer: Principles and Practice of Oncology,* ed. DeVita, Samuel Hellman, and Steven A. Rosenberg, (Philadelphia: Lippincott, 1982), pp. 132–155, on pp. 132–133. A few oncologists look to an earlier remedy as a stimulant to chemical therapy. In 1865 Lissauer ("Zwei Falle von Leucaemie," *Berliner Klinische Wochenschrift,* 1865, *2*:403–404) reported a useful systemic agent in the treatment of neoplastic diseases. The agent was potassium arsenite, which became know as Fowler's solution, but it also produced arsenical keratosis and carcinomas, as reported by Jonathan Hutchinson, "On Some Examples of Arsenic-Keratosis of the

in recent decades complex organic compounds, often plant alkaloids, have produced increasingly successful results as one by one new agents are found and clinically tested.

In 1955 the United States Cancer Chemotherapy National Service Center (NSC) began cataloguing potential plant antitumor agents.[3] Many plants were nominated as candidates for listing by "both the technical literature and folklore." Although historical sources were included under the rubric "folklore," no qualitative historical research was employed to identify potential agents. Many major medical writings were not systematically searched and, for the most part, they were read in translations. The resultant NSC catalogue was impressive in size, but because a single suggestion of a plant in any type of source qualified the plant for the list, so many were listed—over 3,000 species—that using the guide for laboratory testing is difficult.

A more historically oriented approach could well constitute such a guide. A search through the leading pharmaceutical and medical authorities of the Greco-Roman, classical Islamic, and medieval periods reveals that they recommended many of the same natural sources as those for the compounds discovered in the 1960s and 1970s and currently utilized in cancer treatments. For example, in the first century Dioscorides (fl. ca. A.D. 50–79) employed a drug made from autumn crocus (*Colchicum autumnale* L.), the very plant investigated by A. P. Dustin in 1938, as an antitumor agent. Dioscorides recommended that the plant (*kolchikon*) be "soaked in wine and administered to dissolve tumors (*oidêmata*) and growths (*phumata*) not yet making pus."[4] Compounds from this and other plants were neither historically nor are they now the "magic bullet," but they are helpful, sometimes very helpful, in cancer therapy.

"CANCER" IN ANTIQUITY AND THE MIDDLE AGES

Several questions must be answered before recommendations like Dioscorides' can be evaluated, whether historically, for the light they shed on the medicine of the time—especially its probable efficacy—or scientifically, for the direction they might give to current research. First, we need to know whether the ancients had cancers and whether their medicine was capable of distinquishing between benign and malignant neoplasms. The answer to the first question is assuredly affirmative. There is persuasive paleopathological evidence, and such authorities

Skin and of Arsenic-Cancer," *Transactions of the Pathological Society of London,* 1888, *39*:352–363. For a review of systemic therapy of cancer, see Michael B. Shimkin, *Some Classics of Experimental Oncology: 50 Selections, 1775–1965* (NIH Publication No. 80-2150) (Washington, Department of Health and Human Services, 1980), pp. 651–704.

[3] J. L. Hartwell, "Plants Used Against Cancer," *Lloydia,* 1967, *30*:379–436; 1968, *31*:71–170; 1969, *32*:79–107, 153–205, 247–296; 1970, *33*:97–194, 288–392; 1971, *34*:103–160, 204–255, 310–361, 386–438; reprinted in Hartwell, *Plants Used Against Cancer: A Survey* (Lawrence, Mass.: Quarterman Publications, 1982). For an excellent discussion of advantages and disadvantages of "folklore" nomination of plants for screening, see Matthew Suffness and John Douros, "Drugs of Plant Origin," *Methods in Cancer Research,* 1979, *16*:76–126, on pp. 76–77.

[4] Dioscorides, *De materia medica,* 4.84, ed. Max Wellmann, 3 vols. (Berlin: Weidmann, 1906–1914; rpt. 1958). This and other translations, unless otherwise noted, are my own. For what can be deduced about Dioscorides' life and career, see John Scarborough and Vivian Nutton, "The Preface of Dioscorides' *Materia Medica*: Introduction, Translation, Commentary," *Transactions and Studies of the College of Physicians of Philadelphia,* 1982, N.S. *4*:187–227, on pp. 192–194; and John Riddle, *Dioscorides in Medicine and Pharmacy,* (Austin: Univ. Texas Press, 1985).

as Galen (A.D. 129–post 210) and Avicenna (ca. 980–1037), gave good descriptions of neoplastic tumors.[5] Galen and the Byzantines used the term *onkos* to cover swellings, all types of tumors, and lesions. Ancient and medieval writers employed a variety of terms to describe tumors and other lesions, many of which will be discussed in this article.

From the Hippocratic period, the belief in the etiology of cancer was fairly constant. It was an inflammation (Greek *phlegmonê, phlogôsis*; Latin *inflammatio*) derived from an excess of black bile. Avicenna describes a "malignant" tumor as follows:

> Cancer [*cancer* in Gerard of Cremona's Latin translation] is an atrabilious [black bile] swelling (tumor); its development is from combustible (metabolized) atrabile through a biliary substance or through a substance in which there is a biliary element combusted (metabolized) from it, not through turbid drainage. It differs from *scirrhus* [benign solid tumor which may turn malignant] by being accompanied by pain, acuteness and some degree of beating (throbbing) and rapid growth because of increase of (its) substance and swelling as a manifestation of this substance boiling at its junction with the organ. It differs also (from the scirrhus) by the vessels which formed around it to the organ in which it exists simulating the legs of cancer crab and it is not red as *cellulitis* but "with a trend" to blackness, heat and greenness. . . . And it differs from the true scirrhus by being sensitive while the former has no sensitivity. On its onset it (cancer) is concealed and when it is manifested it is problemic in most cases. Then its signs become apparent. And the initial manifestation is a small solid rounded sprout, dark in color, with some kind of warmth. And there is a kind of cancer that is very painful and there is a kind that produces little pain; silent. And there is a kind of cancer that is unchanged, does not ulcerate.[6]

Galen and Avicenna both characterized most malignant tumors as potentially suppurating, and Galen was especially careful to distinguish suppurating atrabilious metabolizations from those excretions that come from boils, carbuncles, and ulcers.[7]

Greek and Latin had a number of terms that covered malignant tumors; many that may refer to a malignant tumor will be discussed in this article, but only in specific contexts about their therapy. Dioscorides' terms *oidêmata* and *phumata* probably included malignancies, but they were not restricted to that condition. Also there is Galen's Greek term *karkinos* (sometimes *karkinôma*; Latin, *cancer*) which often meant malignant lesions, but not always. Obviously the ancients could not have had the histological diagnosis for malignant neoplasms that

[5] For paleopathological evidence, see D. Brothwell, in *Diseases in Antiquity* (Springfield: Thomas, 1967), pp. 320–345; Keith Manchester, "Secondary Cancer in an Anglo-Saxon Female," *Journal of Archaeological Science*, 1983, *10*:475–482; Aidan and Eve Cockburn, *Mummies, Disease and Ancient Cultures* (Cambridge, Cambridge Univ. Press, 1983), pp. 37–38; for descriptions, see Galen, *De tumoribus praeter naturam*, in *Opera omnia*, ed. C. G. Kühn, 20 vols. (Leipzig, 1821–1833; Hildesheim: Olms, 1965), Vol. VII, pp. 705–732; Avicenna, *Canon*, 1.2.1.5–4.3.1.15 (Venice, 1507; facs. ed. Hildesheim: Olms, 1964); Aristotelis Eftychaidis, "The Oncology of Nicolaos Myrepsus in Byzantium of the 13th Century" (in Greek), *Hellenic Oncology*, 1981, *17*:38–47, and Eftychaidis, "Oncological Opinions of Byzantine Medical Writers: Neophytus, Maximus Planudes, and John, Bishop of Prisdaunon" (in Greek), *Hell. Onc.*, 1981, *17*:109–116; for an excellent discussion of the Greek terms for cancer, see L. J. Rather, *The Genesis of Cancer: A Study in the History of Ideas* (Baltimore: Johns Hopkins Press, 1978), pp. 9–13.

[6] Avicenna, *Canon*, 4.3.1.15, trans. from Arabic in I. Eltorai, "Avicenna's View on Cancer from his Canon," *American Journal of Chinese Medicine*, 1979, *8*:276–284, quoting from pp. 277, 280.

[7] Galen, *De tumoribus*, 3, in *Opera*, ed. Kühn, Vol. VII, pp. 715–716, trans. in Jeremiah Reedy, "Galen on Cancer and Related Diseases," *Clio Medica*, 1975, *10*:227–238, on p. 232.

we have. We can only conclude that their terms had the lexical range to include malignancies in our sense of the term. In the instance above, Dioscorides probably meant his therapy to apply to malignant neoplastic lesions, for we know the ancients had cancer, that they recognized it (although not precisely), that Dioscorides was correctly pointing to it when he implied suppuration, and that this particular therapy, because of its side effects, would probably not have been resorted to for a benign tumor.

Any claim that the ancients had an effective cancer "cure" must be qualified, perhaps even denied. Since Dioscorides gives no information about the exact preparation, concentration of colchicine, dosage, frequency, or administration site, the likely efficacy of his treatment cannot be estimated. Such information, critical to modern evaluations, was not usually given by classical and medieval authorities. Any instructions given are never adequate when judging potential effects of toxic—antimitotic and cytotoxic—drugs employed in cancer therapy. Premodern authorities assumed that their work was to guide those already knowledgeable in the observation of plants (especially proper harvesting periods), drug preparation, dosage, and frequency, as well as in making good diagnoses. Without this information, we can only make informed conjectures about what they were treating and how they were doing it. Autumn crocus contains a sufficient concentration of colchicine for pharmaceutical efficacy, but on the basis of modern studies, we conclude that the drug would arrest tumor mitoses in man but would not produce a complete regression in a malignant tumor.[8] An ancient or medieval physician, treating a malignant growth topically and possibly internally, would probably observe a beneficial response but not a "cure."

Not all early authorities recommended autumn crocus as an antitumor agent. While Dioscorides reported its use, Pliny (A.D. 23–79) recommended it only as an emetic. Galen recommended the plant as a medicine against tumors (*phumata*); Oribasios (325–403) again recommended it only as an emetic. Paulos Aegineta (seventh century) wrote only of its being a "breaking up" agent. Some Latin writers, such as Constantinus Africanus (d. ca. 1087) and Hildegard of Bingen (1098–1178), did not recommend it at all against tumors, despite knowing the plant; Matthaeus Platearius (d. 1161?) and Avicenna employed the plant in ways that suggest antitumoral activity. Platearius, for example, recommends it "contra morbos ex flegmate; . . . . Carnem superfluam corrodit . . . et licinium intinctum fistule imponatur." Abū Manṣūr (fl. 968–977) said that the drug concocted from it is poisonous but dries up old sores.[9] In light of this evidence, one can conclude that prior to the thirteenth century autumn crocus was em-

[8] The antitumor agent in colchicine is demecolcine (desacetyl-N-methylcolchicine), a bona fide anticancer drug whose use the Federal Drug Administration has not approved in the United States. Because the premodern physicians were dealing with crude drugs, I shall use the broad term colchicine. On demecolcine, see Irving S. Johnson, "Plant Alkaloids," in *Cancer Medicine,* ed. James F. Holland and Emile Frei III, 2nd ed. (Philadelphia: Lea & Febiger, 1982), pp. 910–920. On colchicine, see O. J. Eigsti and Pierre Dustin, Jr., *Colchicine—in Agriculture, Medicine, Biology, and Chemistry* (Ames: Iowa State College Press, 1955), p. 264; and William A. Remers, ed., *Antineoplastic Agents* (New York: Wiley, 1984), p. 214. John Edmund Driver and George E. Trease, *The Chemistry of Crude Drugs* (London: Longmans, Green, 1938), p. 92, give the colchicine concentration in the cormseeds of autumn crocus as between 2% and 8%. Experimental dosages of the cormseeds have ranged from 130 mg to 300 mg; *Dispensatory of the United States of America,* 25th ed. (Philadelphia: Lippincott, 1955), pp. 351–357, on p. 357. Mammary tumors in dogs have been treated with colchicine: 2 dosages of 0.25 mg, 2 dosages of 0.5 mg, and 2 dosages of 1 mg over a six day course, *Merck Index,* 8th ed. (Rahway, N.J.: Merck, 1968), p. 278.

[9] Pliny, *Natural History,* 28.45.160, ed. W. H. S. Jones, 10 vols. (Loeb Classical Library)

ployed as an anticancer agent, but that its use was not widespread. The reluctance may have been due to the belief expressed by Hildegard, who said that it was more of a poison than a medicine. An interesting and possibly significant footnote: in a field study of traditional medicine in Greece conducted between 1947 and 1960, autumn crocus was reported to be taken internally against cancer.[10]

METHODOLOGY

In what follows I identify modern agents and then seek their counterpart in the historical records. Some historians may object that it would be better methodology to list all the remedies employed as cancer agents in the historical records and then evaluate them in light of modern medical studies. In general, I agree with the objection, but for the purposes of this article, the better method would produce a much longer study without appreciably different results as to the question whether the premoderns had some effective cancer drugs. A major obstacle is that the longer process would produce many plants that cannot be firmly identified. For instance, in his pharmaceutical treatises, Galen employed only three herbs in the treatment of *oidêmata* (whose meaning we established includes malignant tumors): *akantha(-os) leukê, damasônion,* and *orchis*.[11] The identification of all three is uncertain. *Akantha leukê*—"white thorn"—may be *Acacia albida* Delile, *Euphorbia antiquorum* L., or *Cnicus arvensis* Hoffm., or possibly something else. Each of these is reported in modern studies as being used in various East Asian cultures for cancer therapies. Galen's *damasônion* may be our *Alisma plantago* L., and *orchis* may be either *Ophrys apifera* Huds. or *Orchis* sp. Alisma is reported in modern Chinese medicine as treating leukemia patients effectively, and various species of orchis have been employed for a long period in Western European medicine as an anticancer drug.[12] Beyond problems of plant identification, other uncertainties involved in evaluating Galen's drugs for *oidêmata*, such as uncertain diagnosis and a lack of corresponding modern clinical studies, make difficult even tentative conclusions about these remedies'

(London: Heinemann; Cambridge, Mass.: Harvard Univ. Press, 1938–1962), Vol. VII, p. 110; Galen, *De simplicium medicamentorum temperamentis ac facultatibus,* 6.25, s.v. *ephêmeron* (= *kolchikon*), in *Opera,* ed. Kühn, Vol. XI, pp. 879–880; Paulos Aegineta, *Epitomae medicae,*. 7.3., s.v. *ephêmeron,* trans. Francis Adams, 3 vols. (London: Sydenham Society, 1847), Vol. III, pp. 119–120; Oribasios, *Collectiones medicae reliquae,* 11.29, s.v. *ephêmeron,* ed. Johannes Raeder, 4 vols. (Corpus Medicorum Graecorum, 6.1, 2) (Leipzig: Teubner, 1928–1933), Vol. II, p. 111; Constantinus Africanus, *Liber de gradibus,* in *Opera* (Basel, 1536), p. 379, s.v. *hermodactilus* (= *colchicum*); Hildegard von Bingen, *Physicas,* 2.91, s.v. *hermodactylus* (Strassbourg, 1533); ed. and trans. I. Muller (Salzburg: Muller, 1982), p. 99; Matthaeus Platearius, *Circa instans,* s.v. *hermodactilis,* ed. H. Wölfel (Berlin: Preilipper, 1939), p. 61; Avicenna, *Canon,* 2.2.354, fols. 122v–123r; and Abū Manṣūr Muwaffaq ibn Ali Harāwī, *Die pharmakologischen Grundsätze (Liber fundamentorum pharmacologiae),* trans. Abdul-Chalis Achundow, *Koberts historischen Studien aus dem Pharmakologischen Institute der kaiserlichen Universität Dorpat,* 1893, *3*:137–481, on p. 222, no. 330. Kurt Ruegg, *Beiträge zur Geschichte der officizinellen Drogen: Crocus, Acorus calamus und Colchicum* (Basel: Schahl, 1936), pp. 231–232, believes that Pliny and Galen may have intended *Iris agrestis* rather than *Colchicum autumnale*; however, in my opinion the traditional identification of autumn crocus is correct.

[10] G. Lawrendiadis, "Contribution to the Knowledge of the Medicinal Plants of Greece," *Planta Medica,* 1961, *9*:164–169.

[11] Galen, *De simplicium facultatibus* 6.1, 6.4, 7.15, in *Opera,* ed. Kühn, Vol. XI, pp. 819, 861; Vol. XII, p. 93.

[12] Hartwell, "Plants," *Lloydia,* 1970, *33*:98–99 (*Acacia* sp.); 1969, *32*:159 (*Euphorbia antiquorium*); 1968, *31*: 134, 137, 138, 146 (*Orchis* sp.); 1967, *30*:389 (*Alisma plantago*); 1970, *33*:309 (*Orchis* sp.).

relation to modern scientific studies. A comprehensive approach examining all ancient and medieval anticancer drugs would, I suspect, run into the same problems as those attendant on Galen's *oidêmata* remedies, and the main point would be obscured. If, however, it can be shown that modern chemotherapy agents for cancer were employed in much the same way by ancient and medieval peoples, the case can be made that other drugs which they used and we have not evaluated would be a rational place to begin screening tests.

For example, one ancient and medieval remedy not employed in modern scientific medicine is nightshade (Greek *strychnos*; Latin *solanum* = *Solanum* sp. in Linnean classification). It is a poisonous, alkaloid plant, and Galen thought it especially helpful as an applicant for "ulcerated cancers" (*hêlkêka karkinos*). Dioscorides applied nightshade externally for *erysipelas* and *herpês*. While Pliny gave no specific medicinal uses for it, Celsus applied it on *erysipelas*. Later writers continue the prescription. Today in traditional medicine around the world, nightshade is used to treat cancers, but modern Western medicine does not employ the plant.[13]

Although making an exact count of remedies such as nightshade is impossible, for it would depend on the criteria followed, the number of drugs used in cancer therapy both in modern Western medicine and in ancient and medieval Western medicine is small. One study in 1977 showed only ten plant species employed or being tested in actual clinical studies.[14] While the number of plants used by ancient and medieval authorities is larger, it is not so large that statistical probability alone would account for several drugs used in modern chemotherapy appearing among them, rather than the early authorities' recognition of antitumoral properties. For instance, in the first two books of his work, Dioscorides prescribes only two drugs for *oidêmata*, both in contexts that do not suggest anticancer activity. One, kermes oak, "helps" the tumor, which suggests symptomatic relief; the other, myrrh, is used against tumors caused by poisonous snake bites.[15] He gave only three treatments for *karkinas* (*karkinôma*): frankincense, nettle (*Urtica pilulifera* L. and *U. urens* L.), and figwort (*Scrophularia peregrina* L.).[16] In his entire work, Dioscorides discussed only about seven hundred plants.

ANCIENT AND MEDIEVAL CANCER DRUGS

Of all the classical authorities, only Dioscorides appears to have recognized the actions of plant alkaloids. First he grouped them together by drug affinities: for

[13] Galen, *Ad Glauconem de medendi methodo,* 2.12, in *Opera,* ed. Kühn, Vol. XI, p. 143; cf. Galen, *De simplicium facultatibus,* 8.19., s.v. *truchnon ê strychnos*: "*ἕλκη κακοήθη καὶ νομώδη θεραπεύει,*" *Opera,* ed. Kühn, Vol. XII, p. 146; Dioscorides, *De materia medica,* 4.70, ed. Wellmann, probably for *Solanum nigrum* L.; Pliny, *Natural History,* 27.107.132; Celsus, *De medicina,* 5.26, 33a–b, ed. W. G. Spencer, 2 vols. (Loeb Classical Library) (London: Heinemann; Cambridge: Harvard Univ. Press, 1935–1938), Vol. II, p. 102; Paulos Aegineta, *Epitomae mediciae,* 7.3., s.v. *strychnos*; Platearius, *Circa instans,* 718, ed. Wölfel (cit. n. 13): "contra apostemata in stomacho et intestinis"; Rufinus, *Herbarius,* fol. 104rb–104va, in *The Herbal of Rufinus,* ed. Lynn Thorndike with Francis S. Benjamin, Jr. (Chicago: Univ. Chicago Press, 1945). On modern use for *Solanum dulcamara* L., see George Edward Trease and William C. Evans, *Pharmacognosy,* 11th ed. (London: Tindall, 1978), p. 621.

[14] Walter H. Lewis and M. P. Elvin-Lewis, *Medical Botany* (New York: Wiley, 1977), p. 133.

[15] Dioscorides, *De materia medica,* 1.87, 106, ed. Wellmann.

[16] *Ibid.*, 1.68, 4.93–94.

example, he put plants containing the papaverine alkaloids in one group and those containing tropane alkaloids in another.[17] Second, he employed many of the same plants that we have rediscovered and currently employ. Many of those alkaloids he said were good as antitumor agents. One such plant is the squirting cucumber (*Ecballium elaterium* L.). In 1958 a chemical compound from this plant was found to have "strong antitumor activity against sarcoma."[18] Almost alone among the classical writers, Dioscorides recommended squirting cucumber to "dissolve old, soft tumors (*oidêmata*)." Pliny recommended this same plant as a remedy for a variety of skin conditions, including *psora, lichen,* and *parotis*.[19] These terms may have had the lexical range to encompass malignancies, but Latin and Greek dermatological afflictions are notoriously difficult to translate into modern terminology. For example, Galen said that *psora* was called cancer (*karkinos*), if it "occurred in the veins and flesh."[20] Scribonius Largus (fl. reign of Claudius, A.D. 41–54) prescribed squirting cucumber for *condylomata,* or lumps associated with the anus. These could be malignant anal lesions, but one has no justification to conclude that they were—merely that they could be. Galen, Paulos Aegineta, Cassius Felix (fl. 447), Constantinus Africanus, and Rufinus (fl. 1287) gave no clear recommendations for the plant in conjunction with tumors and neither did such Islamic authorities as Avicenna, Ibn Sarābī (or Serapion, d. ca. 1074), and Māsawaih (or Mesue, 925–1015).[21] This evidence suggests that although the plant was not widely employed against tumors (many of which were malignant lesions), the continuous reliance on the authority of Dioscorides makes it nonetheless likely that there was occasional use of the plant for cancer treatments. This remedy has persisted in folk medicine, so that modern investigators learned in 1952–1953 that the squirting cucumber was taken orally for cancer.[22]

In the same section of his treatise Dioscorides recommended the bulb of *Narcissus* sp. for a variety of skin afflictions (*epsêlis, alphos, helkos,* and *apostêma*). Narcissus contains colchicine, and an extract from the bulb is employed in modern chemotherapy for cancer. But the plant also contains calcium oxalate, and because some of these afflictions were sores and wounds, the action may have been cleansing owing to the calcium oxalate rather than to antitumoral activity.[23] Also in the same sequence Dioscorides prescribed the castor bean (*Ricinus communis* L.) for *oidêmata* and *erysipelata,* the latter being, according

[17] *Ibid.*, 4.63–67 (for papaverine-yielding plants); 4.70–75 (for tropane-yielding plants), ed. Wellmann.

[18] D. Lavie and D. Willner, "The Constituents of *Ecballium elaterium* L. III. Elatericin a and B[1, 2]," *Journal of the American Chemical Society,* 1958, *80*:710–714.

[19] Dioscorides, *De materia medica,* 4.150, ed. Wellmann; Pliny, *Natural History,* 20.2.4, ed. Jones.

[20] Galen, *De tumoribus,* 13, in *Opera,* ed. Kühn, Vol. VII, p. 727; trans. Reedy in "Galen on Cancer" (cit. n. 7), p. 236.

[21] Scribonius Largus, *Compositiones,* 224, ed. Sergio Sconocchia (Leipzig: Teubner, 1983); Galen, *De simplicum facultatibus,* 8.15, s.v. *sikuos* in *Opera,* ed. Kühn, Vol. XII, p. 122; cf. Galen, *Hippocratis Epidemiorum libri II,* 5.7, in *Opera,* Vol. XVIIA, p. 472; Paulos Aegineta, *Epitomae medicae,* 7.3., s.v. *elatêrion*; Cassius Felix, *De medicina,* 8, ed. Valentin Rose (Leipzig: Teubner, 1879), p. 15; Constantinus, *De gradibus* (no entry); Rufinus, *Herbarius* (cit. n. 13), fol. 49vb; Avicenna, *Canon,* 2.2.181, s.v. *cucumer asininus*; Ibn Sarābī, *Simplicibus medicinis,* 196, ed. Otto Brunsfels (Strassbourg, 1531), p. 133; and Māsawaih al-Mārdīnī, *De simplicibus,* 2.7 (Venice, 1558), fol. 64.

[22] Hartwell, "Plants against Cancer," *Lloydia,* 1969, *32*:96, citing the National Cancer Institute's central file.

[23] Dioscorides, *De materia medica,* 4.158, ed. Wellmann; for the narcissus as containing colchicine and calcium oxalate, see Lewis and Elvin-Lewis, *Medical Botany* (cit. n. 14), pp. 135, 78, 80.

to Galen, a protocancerous condition.[24] The castor bean contains ricin, currently recognized for its antitumorous qualities and employed in cancer chemotherapy research, although because of its high cytotoxicity, present attention is directed towards binding monoclonal antibodies to it to impart tumor specificity.[25] Following his discussion of the castor bean plant, Dioscorides gave a number of recommendations for spurge (*Euphorbia* sp.)—which is in the same family, Euphorbiaceae, as castor bean—as a remedy for afflictions suggestive of cancer. He added that spurge causes loss of hair, weight, and color, and that it even causes death.[26]

Some later writers recommended narcissus, castor bean, and spurge as antitumoral drugs, but many were silent.[27] In one of his pharmaceutical treatises, Galen clearly used narcissus for cleaning wounds (*traumata*) and not as an antitumor agent, but he recommended spurge for a number of types of tumors (*helkos, lichên, psôra, phagedaina, anthrax,* and *gangrainôde*), which in his treatise on tumors he said were often malignant. A preparation of spurge, called *elatêrion,* is given for an incipient cancer (*karkinos genomenos*), according to Galen.[28] Galen described castor bean as good for its dispersing and discutient property (*diaphorêtikos dynamis*), which could very well apply pharmaceutically to antitumoral action, although he did not specify that action, merely the property. Similarly Constantinus Africanus said that spurge was warming and drying to the fourth degree of intensity, thereby making it an extremely dangerous drug, and that it acted to purge black bile and viscous humors.[29] In the context of medieval science, these properties would be sought in a drug against cancer because that disease was in theory an excess of black bile, and any drug having the property of purging black bile would be suitable for testing as an antitumor agent. Drugs so strong in intensity as the fourth degree were considered drastic, life-threatening poisons, to be administered only in extremely severe conditions.[30]

Avicenna recommended narcissus for a variety of dermatological afflictions, none suggestive of cancer, but Rufinus clearly stated that a drug from the plant

[24] Dioscorides, *De materia medica,* 4.161, ed. Wellmann; Galen, *De tumoribus,* 9, in *Opera,* ed. Kühn, Vol. VII, pp. 723–724; trans. Reedy in "Galen on Cancer" (cit. n. 7), p. 235.

[25] Emil Frei, "Pharmacology," in *Cancer: Achievements, Challenges, and Prospects for the 1980's,* ed. Joseph H. Burchenal and Herbert F. Oettgen, 2 vols. (New York: Grune & Stratton, 1981), Vol. I, pp. 108–122, on p. 113; Lewis and Elvin-Lewis, *Medical Botany* (cit. n. 14), p. 135.

[26] Dioscorides, *De materia medica,* 4.164–169, s.v. *sikuos agrios,* ed. Wellmann.

[27] Hartwell, "Plants against Cancer," *Lloydia,* 1967, *30*:391, citing a quotation in Aetios of Amida, alleges that Soranus recommended narcissus for scirrhous tumors of the uterus. My reading of Soranus's statement was that narcissus was employed as a uterine injection to treat an atonic womb. See Soranus, *Gynecology,* 3.13, trans. Owsei Tempkin (Baltimore: Johns Hopkins Univ. Press, 1956), p. 172; Aetios of Amida recommended narcissus as a cleansing agent in *Libri medicinales,* 1.293, ed. A. Oliveri, 2 vols. (Corpus Medicorum Graecorum, 8) (Leipzig: Teubner), Vol. I (1935), p. 114.

[28] Galen, *De simplicium facultatibus,* 8.13., s.v. *narkissos,* in *Opera,* ed. Kühn, Vol. XII, pp. 85–86; *ibid.,* 8.19., s.v. *tithymalli* (=spurge), in *Opera,* Vol. XII, p. 142; Galen, *Hippocratis Epidemiorum libri II,* 5.8, in *Opera,* Vol. XVIIA, p. 477 (*elatêrion* = a preparation from spurge); on relating terms to cancer, cf. Galen, *De tumoribus,* 6–9, in *Opera,* Vol. IX, pp. 719–724, and trans. Reedy in "Galen on Cancer," pp. 234–235; Galen, *De simplicium facultatibus,* 7.10, s.v. *kikeôs,* in *Opera,* Vol. XII, p. 26.

[29] Galen, *De simplicium facultatibus,* 7.10.24, in *Opera,* ed. Kühn, Vol. XII, p. 26; Constantinus, *De gradibus,* p. 387.

[30] Georg Harig, *Bestimmung der Intensität im medizinischen Systems Galens* (Berlin: Akademie Verlag, 1974); Jerry Stannard, "The Theoretical Bases of Medieval Herbalism," *Medical Heritage,* 1985, *1*:186–198, on 189.

was applied topically on tumors (*super tumores*). Henri de Mondeville (ca. 1260–1320) prescribed narcissus for indurations and making various tumors soft. On the other hand, Matthaeus Platearius omitted all these poisonous plants, that is narcissus, castor bean, and spurge, from his popular herbal pharmacy. Abū Manṣūr prescribed the castor bean as an antitumor remedy.[31] Some of these drugs, however, are found in folk usages against cancer. The castor bean is or was employed for cancers and tumors in traditional Chinese medicine, Ayurvedic, South American, Indian, San Dominican, and modern Californian folk medicine. Various species of spurge are employed against cancer among the Bantu tribes of South Africa, India, and Finland, among other traditional medicine systems.[32]

Dioscorides placed yet another plant, *Vinca major* L., in the same sequence with plants containing alkaloids having antitumor activities, but he did not list the plant as specifically active against tumors. Pliny, however, said that *vicapervica* (= *Vinca*) "dried tumors."[33] A genus closely related to *Vinca* is *Catharanthus*. From one of its species, *C. roseus* G. Don, comes the present source for vinblastine and vincristine, which are remarkably effective against acute lymphocytic leukemia, Hodgkin's disease, carcinoma, and lymphosarcoma. Until 1948, *C. roseus* was classified as *Vinca rosa* L.[34] *Vinca major* has no active antitumor compounds, just as Dioscorides observed by omitting this use in discussing the plant. *Vinca* plants were found in the various regions of the eastern Mediterranean where Dioscorides traveled, but *C. roseus* is found in tropical settings, such as Madagascar and India. Many drugs, however, came to the Greeks and Romans from these regions, for example, cassia, cinnamon, and pepper; it is possible that Pliny was referring to a drug taken from the *Catharanthus,* inasmuch as the two genera are so similar that, despite the plant's importance, botanists did not reclassify *Vinca rosa* L. as *Catharanthus roseus* G. Don until recently. Even if Pliny (or his sources) intended the plant that is the source for our cancer therapy, we can be certain that the classical therapeutic use of the catharanthic alkaloids did not have the success that the present therapy has, with its isolation and concentration of active compounds and well-regulated administration. Nonetheless we can hypothesize that some ancient physicians may have observed some beneficial actions as a result of their treating cancers with *Catharanthus*. Possibly their inability to distinguish *Vinca* sp. and *C. roseus* hindered their confidence in the drug derived from the correct species.

Other plants, non-alkaloid-producing but nonetheless toxic, were used against cancers. One, a legume, provides an interesting insight. The plant is one or two species of *Vicia, V. ervilla* L., bitter vetch, or *V. fava* L., horse bean. Its seeds are poisonous but edible if properly prepared and cooked. Dioscorides

[31] Avicenna, *Canon,* 2.2.514; Rufinus, *Herbarius* (cit. n. 13), fol. 73rb; *Chirurgie de Henri de Mondeville,* 3. Chir. sp. Apostemes. Doct. 2.7.2, 18.2; 4. Doct. 2; Antidotaire. 3.B.2, 5.1, 8.2, 11. 118, ed. A. Bos (Paris, F. Didot, 1897–1898); Abū Manṣūr, *Liber fundamentorum pharmacologiae,* 174, in "Die pharmakologischen Grundsätze," trans. Achundow (cit. n. 9), p. 195.

[32] Hartwell, "Plants against Cancer," *Lloydia,* 1970, *33*:120–122 (castor bean); 158–167 (spurge).

[33] Dioscorides, *De materia medica,* 4.147, s.v. *chamaidaphnê*; and Pliny, *Natural History,* 21.99.172: "vicapervica sive chamaedaphne . . . tumores siccat."

[34] R. L. Noble and Cutts Beer, "Role of Chance Observation in Chemotherapy, *V. rosea,*" *Annals of the New York Academy of Science,* 1958, *76*:882; cf. B. Oliver-Bever, "Vegetable Drugs for Cancer Therapy," *Quarterly Journal of Crude Drug Research,* 1971, *11*:1661–1671, on pp. 1665–1671.

recommended *Vicia* for "cleaning ulcers with honey, moles (*phakoi*), skin spots (*spiloi*), freckles or rough spots (*ephêles*). . ;. [and] it stops boils/ulcers (*nomai*), gangrene or running sore (*gangraina*); it softens hardness (*sklêriai*) in the breast, malignant ulcers (*thêriôdai*), malignant pustules (*anthrakai*), and *kêria* [= yellow and bad skin swelling or ulcer]."[35] The range of contexts suggests that some of the terms would include cancers, especially deep-seated, papillary, and superficial epithelioma and nonspecific, metastatic inflammatory lesions associated with cancer in the stage of ulceration. The vetch plant (*Vicia* sp.) contains vicianin, a cyanogenic glycoside, and was given for cancer into the nineteenth century.[36] Dioscorides did not recommend apricot pits, the source of amygdalin or laetrile, for cancer. Amygdalin, like vicianin, allegedly is effective because it causes cyanide production upon ingestion. Modern science has not found laetrile an effective antitumor agent despite its popularity in underground medical practices.

Certainly not all antitumor discoveries were classical. There is at least one fascinating Byzantine modification. An anonymous herbalist called Pseudo-Apuleius, who lived in the fourth century A.D., wrote in Latin that birthwort (*Aristolochia clematitis* L.), commonly recommended for parturition, was good for nasal carcinoma. Although the Greek term *karkinôma* primarily meant malignant tumors, in this case the context suggests a polyp of the nares, usually a benign tumor in the nasal passage, displaying a pedicle, especially on the mucous membrane. Other surviving classical authorities do not ascribe antitumoral qualities to birthwort. But in or before the fourteenth century, a Byzantine commentator added to a text of Dioscorides a statement that birthwort "helps nose [or, skin?] carcinomas (*ἐν ῥινὶ καρκινώμασι βοηθεῖ*)." The Greek word *ῥίς, ῥινός,* means nostril and *ῥινός, ῥινοῦ* means skin. Whether the commentator meant birthwort to be applied to benign nasal tumor or skin cancer is unclear. Whatever the interpretation, another Byzantine scholium sought to strengthen the claim by changing the verb from "it helps" to "it cures (*ἰᾶται*)."[37] In 1969 aristolochic acid from birthwort was found to have antitumoral qualities, and it is now used in cancer chemotherapy.[38]

In 1971 and in 1972, Lee Wattenberg published studies on the effects of cab-

[35] Dioscorides, *De materia medica,* 2.108, ed. Wellmann.

[36] R. J. McIllroy, *The Plant Glycosides* (London: E. Arnold, 1951), pp. 22–23; *Merck Index* (cit. n. 8), 8th ed., p. 1107; cf. 9th ed., pp. 9624–9625; and Hartwell, "Plants against Cancer," *Lloydia,* 1970, *33*:120–122.

[37] Pseudo-Apuleius, *Herbarius,* 19.7, ed. Ernst Howald and Henry Sigerist (Leipzig: Teubner, 1927): "Ad carcinomata, quae in naribus nascuntur. Herba aristolochia cum cipero et draconteae semen cum melle inpositum emendat." The first scholium is found in Paris, BN MS Gr. 2183, (15th c); Venice, San Marco MS Gr. Z 271 (15th c.); and Salamanca MS 2659 (15th c.); the second in Vienna ON MS Gr. 16 (15th c.); and Vatican MS Palatinus Gr. 77 (15th c.). See John M. Riddle, "Byzantine Commentaries on Dioscorides," in *Byzantine Medicine,* ed. John Scarborough (Washington, D.C.: Dumbarton Oaks, 1984), pp. 95–102; see also Schol. Dioscorides, *De materia medica,* 3.4(5), ed. Wellmann, Vol. II, p. 8n (*apparatus criticus* to line 10). On Pseudo-Apuleius, see Linda E. Voigts, "The Significance of the Name *Apuleius* to the *Herbarium Apulei,*" *Bulletin of the History of Medicine,* 1972, *52*:214–227. Pseudo-Apuleius is a highly unlikely source for the Byzantine commentator's scholium because the Latin herbal ascribed to Apuleius had no Greek counterpart or Greek translation.

[38] S. Munavalli and C. Viel, "Etude chimique, taxinomique et pharmacologique des aristolochiacées," *Annales pharmaceutiques français,* 1969, *27*:449–464, on p. 463; Trease and Evans, *Pharmacogonosy* (cit. n. 13), pp. 98, 577; and *Chemical Abstracts,* 1974, *80*:24780g for (*A. baetica*), 1974, *81*:111458z (for *A. clematitis.*)

bage on drug and carcinogen metabolism, and in 1978 he reported that the compounds in cabbage inhibit chemically induced carcinogenesis in rats. In the same year Japanese researchers found antimutagenic action by cabbage juice.[39] While the research on cabbage and other *Brassica* species is promising, the candidacy of drugs from the genus, most especially cabbage, developed late in modern cancer research. But Cato the Elder (234–149 B.C.) spoke of cabbage around 2,200 years ago: "Of the medicinal value of cabbage: It is cabbage which surpasses all other vegetables. . . . It can be used as a poultice on all kinds of wounds and swelling; . . . it will cleanse suppurating wounds and tumors (*vulnera putida canceresque*), and heal them, a thing which no other medicine can do. . . . An ulcer on the breast and a cancer (*in mammis ulceris natum et carcinoma*) can be healed by the application of macerated cabbage." Similarly Dioscorides prescribed that cabbage be applied directly on tumors (*oidêmata*) to cause them to shrink.[40] The therapeutic use of cabbage by the Greek, Roman, and medieval peoples was chiefly as a drug. Modern research investigates it for desmutagenic activity chiefly in diet;[41] this action, prevention of carcinogenesis, is different from the antitumor activity attested by Cato and Dioscorides. Possibly it is only coincidence that ancient and modern attention focused on cabbage. Possibly also the ancients observed that those whose diet was heavy in cabbage were less susceptible to cancers. Possibly cabbage contains an antitumorial compound. The point is that modern attention to it was not, as best as I can determine, first directed by the history of the substance. Most chemotherapeutical agents of today were rediscovered without benefit of history.

There are animal sources for drugs as well as plant sources, although many fewer. Traditional Chinese medicine employed a drug made from the blister beetle (*Mylabris phalerata* Pall.) for the treatment of malignant diseases. Dioscorides also said that the drug from the beetle was effective against a malignancy (*karkinôdê*), as well as *lepra* and *leichênê*. Pursuing suggestions from a study of the historical traditions, modern Chinese investigators isolated from the crude drug a compound, cantharidin, that is therapeutic for primary heptocarcinoma, intestinal carcinoma, and other cancerous neoplasms.[42]

[39] L. Wattenberg, "Studies of Polycyclic Hydroxylases of the Intestine Possibly Related to Cancer," *Cancer*, 1972, *28*:99–102; Wattenberg, "Enzymatic reactions and carcinogenesis," in *Envirooment and Cancer* (Baltimore: Williams & Wilkins, 1972), pp. 241–255; Wattenberg and W. D. Loub, "Inhibition of Polycyclic Aromatic Hydrocarbon-induced Neoplasia by Naturally Occurring Indoles," *Cancer Research*, 1978, *38*:1410–1411; T. Kada, K. Morita, and T. Inoue, "Anti-mutagenic Action of Vegetable Factor(s) on the Mutagenic Principle of Tryptophas Pyrolysate," *Mutation Research*, 1978, *53*:351– 353; and K. Morita, M. Hara, and T. Kada, "Studies on Natural Desmutagens," *Agricultural Biological Chemistry*, 1978, *42*(6):1235–1238.

[40] Cato, *On Agriculture*, 156.1.–157.4, ed. and trans. W. D. Hooper and H. B. Ash (Loeb Classical Library) (London: Heinemann; Cambridge, Mass.: Harvard Univ. Press, 1934); and Dioscorides, *De materia medica*, 2.121, ed. Wellmann.

[41] Michael Albert-Puleo, "Physiological Effects of Cabbage with Reference to its Potential as a Dietary Cancer-Inhibitor and its Use in Ancient Medicine," *Journal of Ethnopharmacology*, 1983, *9*:261–272.

[42] Bin Hsu, "The Use of Herbs as Anticancer Agents," *Amer. J. Chin. Med.*, 1980, *8*:304–305; Dioscorides, *De materia medica*, 2.61, ed. Wellmann. On the widespread knowledge and use of cantharidin in Greek and Roman pharmacy, see John Scarborough, "Some Beetles in Pliny's *Natural History*," *Colepterists Bulletin*, 1977, *31*:293–296, and Scarborough,"Nicander's Toxicology, II: Spiders, Scorpions, Insects and Myriapods," *Pharmacy in History*, 1979, *21*:73–92, on pp. 73–80. Cantharidin is used in the United States pharmacopeia to remove warts, molluscum, and other benign epithelial growths; see *Physicians' Desk Reference*, 37th ed. (Oradell, N.J.: Medical Economics Company, 1983), pp. 827–828, 1882.

In this study I have developed essentially two lines, one modern and the other ancient and medieval, without showing a definite relationship (except in the case of cantharidin). If extreme care is used, the historian can find it useful to evaluate pharmaceutical records in the light of scientific studies, in order to learn whether early practitioners were, in our judgment, "rational" users of medicines. Medical anthropologists have taught us to be cautious because there are many factors that may determine whether a person finds a drug effective. Nonetheless, the historian wishes to know as a matter of curiosity what the physical effects of given drug therapies might have been. Since most of the plants discussed in this paper are sources of alkaloids, which have a toxic effect (cabbage excepted), it is difficult to believe that they could qualify as placebos, at least in the traditional sense. A drug user would seek positive effects to outweigh the deleterious side effects of these toxins. On the other hand, it is probable that premodern users saw some beneficial responses to these drugs when treating tumorous growths, but, since they lacked the ability to control concentration, dosages, and frequencies, the drugs were probably only marginally efficacious.

In contrast, the modern scientist might employ the history of a drug, especially in the works of the leading medical authorities, as a starting point for conducting animal and clinical tests. Important clues exist in the historical records about which drugs might be worth testing. While colchicine is not a drug of choice for cancer therapy, its chemical analogues are employed, and colchicine proved an important first step in modern chemotherapy.[43] William Stone's speech in 1916 was prophetic. For too long we have believed that the past was filled more with superstition and stupidities than with experienced judgments about medicine.

[43] Remers, *Antineoplastic Agents* (cit. n. 8), p. 214.

Oral Contraceptives and Early-Term Abortifacients during Classical Antiquity and the Middle Ages
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ORAL CONTRACEPTIVES AND EARLY-TERM ABORTIFACIENTS DURING CLASSICAL ANTIQUITY AND THE MIDDLE AGES*

It is generally agreed that oral contraceptives are a product of the second half of the twentieth century and that early-term abortifacients are an even more recent discovery, still in the process of development. This article presents evidence that, contrary to this consensus, pre-modern (like present-day) traditional medical systems employed chemical means of birth-control and — although the evidence for this is less conclusive — that such chemical substances were substantially effective in controlling the birth-rate.

The accepted account of the history of birth-control rests on a particular understanding (sometimes misunderstanding) of what science says is possible. In this article, ancient sources which discuss birth-control (mostly medical) will be interwoven with modern reports from laboratory, clinical and other scientific studies of anti-fertility agents. The article also draws on medieval and early modern sources for the light they can shed on the historical use of some pharmaceutical agents. From this combination of historical and scientific data, it is difficult to avoid the conclusion that the historical records are reliable rather than misleading in suggesting that our female ancestors had some control over their reproductive processes.

It is widely acknowledged that, since at least the second century B.C., populations in the West have been deliberately limiting their rates of growth and, at times, slowing them to below replacement rates. It is thought that this has been achieved through means such as celibacy and sexual restraint, delayed marriages,

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non-fertile intercourse (what Philippe Ariès called "sexual perversity"), the rhythm method, coitus interruptus, vaginal suppositories, condoms, abortions, infanticide and child abandonment. In searching the historical records, however, it is difficult to find proof that any of these practices were sufficiently widespread to produce the results for which we do have evidence: that somehow, in some way, or through some combination of means, and during certain periods, families limited their rates of reproduction.

While it has been suggested that non-surgical abortifacients may have been effective (if only slightly) as a consequence of such a high level of toxicity as to constitute, in the words of Marie-Thérèse Fontanille, a "demographic danger" as a result of "catastrophic female mortality",[1] the idea that the use of contraceptives (in particular oral contraceptives) might have been significant has been rejected simply on the basis that those prescribed could not have been effective. Most of the contraceptives recorded in history are plant substances, and plants have been thought incapable of producing the complex animal molecular hormonal structures that affect fertility. Yet plants have long been used as sources of both contraceptives and early-term abortifacients. Evidence for such usage can be found throughout history, from the earliest known Egyptian medical document down to present-day traditional medical systems.[2] Despite the fact that there is anecdotal evidence in literary texts, and that there is also a great variety of legal, ecclesiastical, theological and medical sources which discuss contraceptives, modern historians have rejected the idea that these agents were functional birth-control measures because they think that modern science demonstrates that such substances could not have been effective. Ariès argued for the virtual absence of contraception in Europe before the seventeenth century on account of its "unthinkability", while Keith Hopkins, who studied the early history of contraception, describes ancient oral

[1] Marie-Thérèse Fontanille, *Avortement et contraception dans la médecine gréco-romaine* (Paris, 1977), p. 195. For source references, see also Enzo Nardi, *Procurato aborto nel mondo greco romano* (Milan, 1971). A recent study of the drugs used to induce abortions asserts that some may have been effective: Achim Keller, *Die Abortiva in der römischen Kaiserzeit* (Quellen und Studien für Geschichte der Pharmazie, xlvi, Stuttgart, 1988).

[2] See Kahnun Papyrii, nos. 21 (3/6), 22 (3/7), in Hildegard von Deines, Hermann Grapow and Wolfhart Westendorf, *Übersetzung der medizinischen Texte*, 2 vols. (Grundriss der Medizin der alten Ägypter, iv, Berlin, 1958), i, p. 277, ii, p. 211.

contraceptives as "ineffectual potions".[3] Scholarship has placed contraceptives more in the realm of magic than of science. My hypothesis is no more than the axiom that one should accept the testimony of the records unless there is compelling reason to reject their validity, *and we have good reason to accept their claims that these agents affected fertility*.[4]

In justifying this claim, this article will proceed from a general review of the evidence provided by modern science concerning plant-based contraceptives and abortifacients to a consideration of a number of plants used in this way in ancient and medieval times. It will then consider medieval additions to classical knowledge, examining how medieval scholars updated texts, before moving on to consider more generally how knowledge of birth-control was transmitted, assimilated and, to some degree, lost.

I
PLANT-BASED CONTRACEPTIVES AND MODERN SCIENCE

The subject of plant-based contraceptives is complex, and requires an introduction. The follicle-stimulating hormone and luteinizing hormone-releasing factors necessary for ovulation which occur in mammals were thought to belong only to the animal and not to the plant kingdom. Two studies published in 1933 were the first to call this view into question. Boleslaw Skarzynski reported to the Polish Academy of Sciences that he had obtained a substance that resembled a human female hormone (trihydroox-

[3] Philippe Ariès, *Histoire des populations françaises et de leurs attitudes devant la vie depuis le XVIII*[e] *siècle* (Paris, 1948), pp. 494-521; see also a later arti Philippe Ariès, "Sur les origines de la contraception en France", *Population*, viii (1953), p. 466, in which he defended his earlier position ("C'est la thèse de l'impensabilité que j'ai défendue"); Keith Hopkins, "Contraception in the Roman Empire", *Comp. Studies in Society and Hist.*, viii (1965-6), p. 131 n. (with reference to oral contraceptives in Dioscorides); for the same view, see Norman E. Himes, *Medical History of Contraception* (Baltimore, 1936; repr. New York, 1963). For some interesting material, see Shirley Green, *The Curious History of Contraception* (New York, 1971).

[4] Some readers of this article may claim that I am guilty of the sin of historical positivism because the study uses modern science to validate historical practices, and selected ones at that. I hope they will not. The current views about the effectiveness of birth-control rest on what earlier historians regarded as possible and this in turn was based on what contemporary science regarded as the rules of nature. Now, in 1991, science has expanded its knowledge, but historians have not taken into account the new findings. Since modern science gives us evidence that the contraceptives and abortifacients that our ancestors took did work, I am asking no more of my colleagues than that they consider the historical record at its face value, or, at least, confront it before rejecting it.

yoestrin) from the willow.[5] In the same year Adolf Butenandt and H. Jacobi announced that the date palm and the pomegranate produced female sex hormones.[6] These reports were at first greeted with scepticism, because plant substances were not thought to function as human hormones and, moreover, because scientists could not duplicate Butenandt and Jacobi's laboratory results.[7]

While the findings of Skarzynski, Butenandt and Jacobi had little immediate impact, however, the results of other important research on the anti-fertility effects of plants on mammals, in the field of animal science, were more generally accepted.[8] During the 1940s it was observed that Australian sheep grazing on a particular type of clover (*Trifolium subterraneum*) experienced sharply reduced fertility. The explanation was found to be the presence in the clover of isoflavonoids, which induce oestrogenic activity in mammals.[9]

Research in anthropology has also yielded important information, especially in studies where the findings are reinforced by laboratory tests. In 1960, following up reports that Thai women take an extract of the root *Pueraria mirifica* (a close relative of kudzu) to induce abortion, D. B. Bounds and G. S. Pope isolated a compound called miroestrol that is more medicinally active than oestrone.[10] Anthropological studies such as this one are important sources of data about actual usage.[11]

[5] Boleslaw Skarzynski, "An Oestrogenic Substitute from Plant Materials", *Nature*, cxxxi (1933), p. 766; Boleslaw Skarzynski, "Recherches sur les corps oestrogènes d'origine végétale", *Zoologischer Bericht*, xxxv (1933), p. 323.

[6] Adolf Butenandt and H. Jacobi, "Über die Darstellung eines krystallisierten pflanzlichen Tokokinins (Thelykinins) und seine Identifizierung mit dem α-Follikelhormon", *Zeitschrift für physiologische Chemie*, ccxviii (1933), pp. 104-12. Butenandt received the Nobel prize for chemistry in 1939.

[7] In 1965 and 1966, however, experiments succeeded in confirming Butenandt and Jacobi's findings. See Erich Heftmann, Shui-Tze Ko and Raymond D. Bennett, "Identification of Estrone in Pomegranate Seeds", *Phytochemistry*, v (1966), p. 1337; Raymond D. Bennett, Shui-Tze Ko and Erich Heftmann, "Isolation of Estrone and Cholesterol from the Date Palm, *Phoenix Dactylifera* L.", *Phytochemistry*, v (1966), pp. 231-5.

[8] See John R. Lacey, Lynn F. James and Robert E. Short, *The Ecology and Economic Impact of Poisonous Plants on Livestock Production* (Boulder, Colo., and London, 1988), esp. p. 9.

[9] H. W. Bennetts, E. J. Underwood and F. L. Shier, "A Specific Breeding Problem of Sheep on Subterranean Clover Pastures in Western Australia", *Australian Veterinary Jl.*, xxii (1946), pp. 2-12. All isoflavonoids are oestrogenic.

[10] D. B. Bounds and G. S. Pope, "Light-Absorption and Chemical Properties of Miroestrol, the Oestrogenic Substance of Pueraria Mirifica", *Jl. Chemical Soc.* (1960), pp. 3696-705; see also J. B. Harborne, *Introduction to Ecological Biochemistry*, 2nd edn. (London, 1982), p. 102.

[11] For references to such studies, see below, p. 31 n. 127.

Finally, other laboratory and clinical studies of the effect of plant substances on animal and human fertility frequently appear in Indian and Chinese medical and pharmaceutical journals. Here specific traditional crude drugs are scientifically tested as alternative sources for the now standard oestrogen-progesterone pills.

II

CONTRACEPTIVES AND EARLY-TERM ABORTIFACIENTS

A variety of plant substances have been used as oral contraceptives, and an even larger number as early-term abortifacients. Although ancient and medieval people distinguished between contraception and abortion, the difference is not always clear, as we shall observe in the cases of ferula and the pomegranate. A few other representative plants are also briefly discussed in this section.[12]

1) *Ferula*

Ferula is a genus of plants, commonly known as the giant fennel. The plant has yellow flowers and grows to the height of a small tree, although it is a scrub. It is found in semi-arid regions, on hillsides and stony slopes. The fragrant pith of the dry stems and the juice from its roots were popular medicines.

In antiquity, ferula was valued both as a contraceptive and as an early-term abortifacient. The ancients knew the difference. Soranus, a writer on gynaecology during the time of Trajan (A.D. 98-117) and Hadrian (A.D. 117-38), made the distinction as follows: "A contraceptive differs from an abortive (*Atokion de phthorion diapherei*), for the first does not let conception take place, while the latter destroys what has been conceived. Let us therefore call the one 'abortive (*phthorion*)' and the other 'contraceptive (*atokion*)' . . . it is safer to prevent conception from taking place than to destroy the foetus".[13]

The first two oral prescriptions mentioned by Soranus use two plants, *silphion* and *opopanax*, both possibly species of ferula.[14]

[12] These are only a selection of the plant-based drugs which I will discuss at greater length in a book: John M. Riddle, *A History of Oral Contraceptives and Early-Stage Abortifacients* (Harvard Univ. Press, forthcoming 1992; provisional title).

[13] Soranus, *Gynaecology*, i.60 (trans. Oswei Temkin, *Soranus' Gynecology*, Baltimore, 1956, pp. 62-3). For the Greek text, see Soranus, *Gynaeciorum libri iv*, ed. Johannes Ilberg (Corpus Medicorum Graecorum [hereafter C.M.G.], iv, Leipzig and Berlin, 1927); *Sorani Gynaeciorum*, ed. Valentin Rose (Bibl. Script. Graec. et Roman. Teubner. [hereafter Teubner.], Leipzig, 1882); Soranus, *Maladies des femmes*, ed. Paul Burguière, Danielle Gourevitch and Yves Malinas (Paris, 1988).

[14] *Ibid.*, i.63.

Opopanax was to be administered with *silphion*, and is our *Ferula opopanax* Spr., or — in some confused modern taxonomy — the closely related *Pastinica opopanax* L.[15] In the nineteenth century, a drug obtained from opopanax was thought to have had the same effects as the drugs from other species of ferula.[16] *Silphion* is a now extinct species of the same genus, which seems to have been collected out of existence.[17] The very high price of *silphion* was remarked in 424 B.C. by Aristophanes — "Don't you remember when a stalk of *silphion* sold so cheap"? — and its scarcity was commented on as early as the first century A.D. by Pliny the Elder.[18] Greek, Roman and medieval medical sources prescribed several species of ferula for anti-fertility effects: among the plants are *Ferula assa-foetida* L. (whose roots have a pronounced, foul smell resembling that of faeces — unforgettable and unmistakable!), *Ferula communis* L. (a source of the drug ammoniacum), *Ferula galbaniflua* Boiss. and Buhse (a source of the drug galbanum), *Ferula tingitana* L. (a source of ammoniacum) and *Ferula persica* Willd. (a source of sagapenum gum). The apparent reason for the extinction of *silphion* is that it was prized more highly than the related species, combined with the fact that ancient attempts to cultivate it were unsuccessful.[19]

[15] *Des Pedanios Dioskurides aus Anazarbos Arzneimittellehre in fünf Büchern*, ed. Julius Berendes (Stuttgart, 1902), p. 297 n. 9; the same plant is classified by D. J. Mabberley, *The Plant Book* (Cambridge, 1987), p. 413, as *Opopanax chironium*, but it is closely related to ferula. From the descriptions of *F. opopanax* Spr./*O. chironium* (L.) Koch, the plant closely resembles *Ferula palmyrensis* Post and Beauverd, in *Index Kewensis plantarum phanerogamarum*, suppl. vol. (Oxford, 1938), p. 114, and I suspect that Berendes's and Mabberley's plants may be *F. palmyrensis*, the plant mentioned by Soranus. Whether they are or not does not affect the important point, which is that their chemistry would be similar, albeit not precisely the same.

[16] Charles Pickering, *Chronological History of Plants: Man's Record of His Own Existence Illustrated through Their Names, Uses and Companionship* (Boston, 1879), p. 158; Friedrich A. Flückiger and Daniel Hanbury, *Pharmacographia: A History of the Principal Drugs of Vegetable Origin, Met with in Great Britain and British India*, 2nd edn. (London, 1879), p. 327.

[17] Alfred C. Andrews, "The Silphium of the Ancients: A Lesson in Crop Control", *Isis*, xxxiii (1941-2), pp. 235-6.

[18] Aristophanes, *Knights*, 893-4, trans. B. B. Rogers, *Aristophanes*, 3 vols. (Cambridge, Mass., and London, 1927), i, p. 213; Pliny, *Natural History*, xix.15.39-41; see also Chalmers L. Gemmill, "Silphium", *Bull. Hist. Medicine*, xl (1966), pp. 295-313; John Scarborough, *Pharmacy's Ancient Heritage: Theophrastus, Nicander, and Dioscorides* (Lexington, Ky., 1984), p. 76, proposing that the plant be called *Ferula cyrenaica* Diosc. in honour of Dioscorides.

[19] Theophrastus, *De historia et causis plantarum*, vi.3.2.5 (ed. and trans. Arthur Hort, *Enquiry into Plants and Minor Works on Odours and Weather Signs*, 2 vols., London, 1916, ii, p. 15).

A study carried out in 1963 confirmed that assafoetida is a contraceptive agent[20] as well as an abortifacient emmenagogue in humans.[21] (An emmenagogue is an agent that stimulates the menstrual function: thus, if there is a pregnancy, an emmenagogue will also cause an abortion.) Ferujol, the active substance in ferula, has been isolated experimentally. In animal tests it was nearly 100 per cent effective in preventing pregnancy when administered to adult rats within three days of coitus at a low dose of 0.6 mg./kg. body weight.[22]

Some early medical writers refer to one or more species of ferula as being either emmenagogues or abortifacients, but do not mention contraception. Dioscorides (*c.* A.D. 40-80) noted that *silphion* induced menstruation, but discussing other species of the same genus he remarked that the plants caused abortion. Galen (A.D. 129-210 or later) and Aetius of Amida (*c.* A.D. 502-75) made similar observations.[23] What are we to make of this apparent confusion between abortion and contraception?

Even though some of the ancients were semantically correct, there appear to be functional complications. An abortifacient is an agent that terminates pregnancy; in modern medicine the agents producing this action are called ecbolics, oxytocics and

[20] Norman R. Farnsworth *et al.*, "Potential Value of Plants as Sources of New Antifertility Agents: I", *Jl. Pharmaceutical Sciences*, lxiv (1975), pp. 554, 590. The medicine enjoys a British and an Indian patent (British pat. 1,025,372 [Cl.A 61k], 6 Apr. 1956; Indian appl., 25 July 1963). In the human experiment the following were taken in equal doses daily for twenty-two days while abstaining from sexual coitus: 4 drams of the active principle from *Empbelia ribes*; 4 drams, *Piper longum*; 2 drams, assafoetida (ferula); and 4 drams of borax (soda). Ferula plants contain both ferulic acid and valeric acid. One species, *Ferula moshchata* Kozo-Polj., is employed in folk medicine in Central Asia: see Keller, *Abortiva*, p. 174.

[21] Farnsworth *et al.*, "New Antifertility Agents: I", p. 576; J. C. Saha, E. C. Savini and S. Kasinathan, "Ecbolic Properties of Indian Medicinal Plants", *Indian Jl. Medical Research*, il (1961), p. 136; M. M. Singh *et al.*, "Contraceptive Efficacy and Hormonal Profile of Ferujol: A New Coumarin from Ferula jaeschkeana", *Planta medica*, li (1985), pp. 268-70, reporting that pregnancy is prevented when an extract of *Ferula jaeschkeana* is given to female rats 1-5 days after coitus.

[22] Singh *et al.*, "Contraceptive Efficacy . . . of Ferujol", pp. 268-70. The statistical reduction was significant: there was less than 1 per cent chance of pregnancy. See also Farnsworth *et al.*, "New Antifertility Agents: I", p. 576; James A. Duke, *C.R.C. Handbook of Medicinal Herbs* (Boca Raton, 1985), pp. 194-5.

[23] Dioscorides, *De materia medica*, iii.48, 80, 81, 83, 84 (ed. Max Wellmann, 3 vols., Berlin, 1906-14; repr. Berlin, 1958); Galen, *De simplicium medicamentorum temperamentis ac facultatibus*, viii.16.4 (ed. C. G. Kühn, *Claudii Galenii opera omnia* [hereafter *Opera omnia*], 20 vols., Leipzig, 1821-33; repr. Hildesheim, 1964, xii, p. 95); Aetius of Amida, *Iatricorum*, xvi.18 (ed. Skévos Zervòs, *Peri tōn en mētrai pathōn*, Leipzig, 1901).

emmenagogues. As already noted, emmenagogues are agents that provoke menstruation whether or not an embryo is present, but since these menstrual agents are not clearly described as such in historical records, historians have not recognized them as such, let alone as abortifacients. The first perceptible evidence of pregnancy is an interruption of the menstrual cycle. But amenorrhoea (the absence or suppression of menstruation) can also be caused by a variety of conditions including febrile and chronic diseases, malnutrition and mental depression. Moreover it is fairly common in conditions other than pregnancy. A physician or a herbalist could not know the aetiology of amenorrhoea reported by a patient within, say, the first months of pregnancy without the sort of tests (now available) which were not known to an ancient or medieval physician. It is difficult to distinguish between idiopathic (genuine) amenorrhoea and early pregnancy, especially if the physician has not conducted a careful case history with a patient who is completely honest. In the mid-nineteenth century, after abortion became a criminal offence in many Western countries (in England in 1803), Charles Meigs, M.D., advised that "The stupidest thing a physician can do, is to be misled by complaints to the administering of drugs and medicines, which may bring on, not the menses, but an abortion, or a premature labor".[24] For this reason traditional emmenagogues were dropped from "official" pharmacy in many countries.

For the purposes of this paper, I shall use the term "abortifacient" as embracing all forms of pregnancy termination that occur even shortly after implantation. Although some religious and ethical doctrines stress the critical dividing-line as the instant in which fertilization takes place, this is not used as the dividing-line in modern medicine, because any agent that interferes with the ovary transport, pre- or post-coitum, and prevents or impairs implantation, is none the less a contraceptive.[25]

Therefore — to answer the question about the ancients' interchanging terms for contraceptives and abortifacients — there appear to be grounds for the confusion. Aetius of Amida and Paul

[24] Charles D. Meigs, *Females and Their Diseases* (Philadelphia, 1848), p. 405.

[25] For example, Anthony A. Elujoba, Stella O. Olagbende and Simeon K. Adesina, "Antiimplantation Activity of the Fruit of Lagenaria Breviflora Robert", *Jl. Ethnopharmacology*, xiii (1985), pp. 281-8, reports that this plant is used as an abortifacient in Nigeria, but is actually an anti-implantation agent: 5g./kg. of the fruit pulp yielded 100 per cent activity: that is to say, all who took this amount aborted/failed to conceive.

of Aegina (seventh century) both noted a series of steps that a woman should take to avoid pregnancy, namely diets, bathing regimens, exercises and oral and applied drugs — and, should the menstrual cycle be delayed, different regimens and other, stronger drugs.[26] The words for emmenagogues and abortifacients were also interchangeable. For example, the words for abortifacients in the Greek text of Oribasius (*fl.* A.D. 385) were translated into Latin as emmenagogues.[27] The Latin version of Dioscorides, made in or around the sixth century, translates Dioscorides' phrase "drives out the menses" (*agōgas emmēnōn*) as "it causes an abortion" (*abortum facit*).[28] In part this confusion of terms may reflect increased medieval sensitivity to the issue of abortion, but this was not universal, since throughout the Middle Ages there were medical writers giving prescriptions explicitly for birth-control.

2) *Pomegranate, an Oral Contraceptive and Vaginal Suppository*

An examination of Soranus' vaginal suppositories provides a background for a closer look at oral contraceptives. Soranus gave six recipes for vaginal suppositories to be taken after the cessation of menstruation, five of which use the peel or rind of a pomegranate.[29] Pomegranate (*Punica granatum* L.) was prescribed in other classical and medieval medical sources. In Greek mythology, moreover, Proserpine ate pomegranate seeds, contrary to Zeus' order, thus preventing her return to earth for more than part of the year, along with the return of fertility. For as many seeds as she ate, she was destined to stay that many months in the Underworld.[30] Pomegranate is also recognized as an abortifacient in ancient Indian literature and in modern folk medicine.[31]

[26] Aetius of Amida, *Iatricorum*, xvi.16-18; Paul of Aegina, *Epitomae medicae*, iii.60.12, 29-34 (ed. J. L. Heilberg, 2 vols., C.M.G., ix, Leipzig, 1921).

[27] Oribasius, *Synopsis*, ii.53 (ed. Charles Daremberg and C. Bussemaker, *Oeuvres d'Oribase*, 6 vols., Paris, 1851-76; repr. Amsterdam, 1962, v, p. 68); *ibid.* (ed. Johannes Raeder, 5 vols., C.M.G., vi, Leipzig, 1926, iii, p. 43); cf. *Oribasius Latinus*, ed. Henning Mørland (Symbolae Osloensis, fasc., suppl., x, Oslo, 1940), pp. 75, 118, 148.

[28] Dioscorides, *De materia medica*, iii.123.1.5; cf. bk. 3 of the old Latin translation, in "Dioscorides Longobardis (Cod. Lat. Monacensus 337)", ed. Hermann Stadler, *Römanische Forschungen*, x (1898), p. 432.

[29] Soranus, *Gynaecology*, i.62.

[30] Ovid, *Metamorphoses*, v.523-50; W. Smith (ed.), *Dictionary of Greek and Roman Biography and Mythology*, 3 vols. (London, 1849), iii, p. 204.

[31] Saha, Savini and Kasinathan, "Ecbolic Properties of Indian Medicinal Plants", p. 140; John Mitchell Watt and M. G. Breyer-Brandwijk, *The Medicinal and Poisonous*

(cont. on p. 12)

This is the plant which Butenandt and Jacobi identified as a contraceptive in the 1930s, an observation confirmed by more recent scientific studies.[32] In laboratory experiments, when paired with males not treated with the plant, female rats fed pomegranate experienced 72 per cent less pregnancies than the control group. In similar tests with guinea pigs none became pregnant. Forty days after the withdrawal of the drug the fertility of both rats and guinea pigs was back to normal.[33] Another laboratory test, on a pomegranate extract not containing the root, resulted in a 70 to 90 per cent inhibition of pregnancy in rats. The scientists conducting the investigation concluded that different extraction methods and morphological plant loci (such as roots, stem or flower) may influence the results,[34] which holds true as a generalization about all herbal substances regardless of how they are administered or applied.

Despite pomegranate's association with limiting fertility, however, it appears to have been seldom used in classical and medieval medicine, to judge from the small number of references to it in medical works and the scarcity of anecdotal literary sources. There is no citation of its use as an oral contraceptive, but only as a suppository, the effectiveness of which is not clearly known. For instance, pomegranate is not mentioned in the various works

(n. 31 cont.)
Plants of Southern and Eastern Africa, 2nd edn. (London, 1962), pp. 875-6, noting anti-fertility uses in Mauritius and Sumatra.

[32] Heftmann, Ko and Bennett, "Identification of Estrone", pp. 1337-9; P. D. G. Dean, D. Exley and T. W. Goodwin, "Steroid Oestrogens in Plants: Re-estimation of Oestrone in Pomegranate Seeds", *Phytochemistry*, x (1971), pp. 2215-16, reporting smaller amounts of oestrogens than those found by Heftmann, Ko and Bennett, and concluding that there may be seasonal variations; Norman R. Farnsworth *et al.*, "Potential Value of Plants as Sources of New Antifertility Agents: II", *Jl. Pharmaceutical Sciences*, lxiv (1975), p. 718. Another animal test demonstrates that pomegranate prevents fertilization at a 50 per cent rate in rats: Anand O. Prakash, "Potentialities of Some Indigenous Plants for Antifertility Activity", *Internat. Jl. Crude Drug Research*, xxiv (1986), p. 23.

[33] M. L. Gujral, D. R. Varma and K. N. Sareen, "Oral Contraceptives: Part 1: Preliminary Observations on the Antifertility Effect of Some Indigenous Drugs", *Indian Jl. Medical Research*, xlviii (1960), p. 50. Another experiment, using the isolated uterus of an albino rat to test compounds, found a "moderate increase in amplitude and frequency of contractions without appreciated alteration in tone" with pomegranate: B. N. Dhawan and P. N. Saxena, "Evaluation of Some Indigenous Drugs for Stimulant Effect on the Rat Uterus: A Preliminary Report", *Indian Jl. Medical Research*, xlvi (1958), p. 811.

[34] A. O. Prakash *et al.*, "Anti-Implantation Activity of Some Indigenous Plants in Rats", *Acta Europae fertilitatis*, xvi (1985), p. 447.

of the Hippocratic Corpus as an anti-fertility agent; nor does it appear in this capacity in the works of antiquity's foremost authority on drugs, Dioscorides. Again, it is absent from the works of Galen; it is, however, prescribed by Ibn Sīnā (Avicenna, *c.* 980-1037) as a pre- and post-coital suppository together with alum, while the Latin translation appears to prescribe oral administration without the alum.[35] Soranus stated that suppositories (which is how he classified pomegranate) were more dangerous than oral contraceptives.[36] Contrary to popular opinion, the ancient Hippocratic Oath did not prohibit abortions; the oath prohibited "vaginal suppositories" presumably because of the ulcerations that they were said to cause.[37] Soranus and other medical authorities recognized what folk medicine must have learned from experience: that while pomegranate was effective, there were other substances that prevented pregnancy which were more effective, easier to administer and less dangerous.

3) *Juniper*

"Gossip records a miracle", states Pliny the Elder: "that to rub it [crushed juniper berries] all over the male part before coitus prevents conception".[38] Dioscorides adds that crushed juniper berries (probably *Juniperus communis* L.) could be placed on the vulva prior to coitus as a contraceptive.[39] Galen refers to two species of juniper as being both a "contraceptive drug" (*atokion esti pharmakon*) and an abortifacient (the verb *ekballei*, "it aborts"

[35] Ibn Sīnā (Avicenna), *Liber canonis*, ii.2.578 (trans. Gerard of Cremona, Venice, 1507; fac. repr. Hildesheim, 1964, fo. 146v). The Arabic text is discussed in B. F. Musallam, *Sex and Society in Islam: Birth Control before the Nineteenth Century* (Cambridge, 1983), pp. 72, 84, *passim*.

[36] Soranus, *Gynaecology*, i.61-3. Specifically, he said that the suppositories were styptic, clogging, cooling and caused ulcerations.

[37] As translated by Ludwig Edelstein, "The Hippocratic Oath: Text, Translation and Interpretation", in *Ancient Medicine: Selected Papers of Ludwig Edelstein*, ed. O. and C. L. Temkin (Baltimore, 1967), p. 6, it states: "Similarly I will not give to a woman an abortive remedy". The critical Greek words here are *pesson phthorion*, which mean "expulsive (*or* abortive) pessary/suppository". For a discussion, see Charles Lichtenthaeler, *Der Eid des Hippokrates: Ursprung und Bedeutung* (Cologne, 1984), pp. 144-52. A Muslim writer, Abu al-Hasan al-Tabib, in explaining why abortions were important if the mother's life was in danger, commented that "This is the reason Hippocrates demands the use of abortive drugs before childbirth": quoted in Musallam, *Sex and Society in Islam*, p. 70.

[38] Pliny, *Natural History*, xxiv.11.18, trans. from the edition by W. H. J. Jones, 10 vols. (Cambridge, Mass., and Boston, 1980), vii, p. 17. Pliny's *cedrus* was probably *Juniperus excelsa* Bieb.

[39] Dioscorides, *De materia medica*, i.77.2.7.

or "it expels").[40] More recently, German women in the late nineteenth and early twentieth centuries took savin, from *Juniperus sabina* L., as an abortifacient.[41] Pliny's and Dioscorides' prescriptions were for vaginal insertion, but other sources are unclear as to the means of administration.

In an experiment the results of which were published in 1986, 200 mg. of an extract of juniper root (*Juniperus communis* L.) were administered orally to laboratory rats with the result of 60 per cent effectiveness in preventing implantation,[42] thus confirming it to be an oral contraceptive (as I classify anti-implantation agents following the medical convention outlined above). Juniper berries were a part of our pharmacopoeia until the last century, as a uterine stimulant. They act as an emmenagogue affecting the menstrual cycle, oils from the leaves are shown by *in vitro* and *in vivo* tests in animals to be uterine stimulants. In experiments on the isolated human uterus and Fallopian tubes, the oils have caused relaxation and inhibited movement to an extent that could lead to an abortion. In fact, there are medically attested cases of abortion induced by juniper toxins.[43] Thus, to judge from what we know now, juniper may have been administered orally or applied externally with both contraceptive and abortifacient results, just as Galen and other classical and medieval medical authorities suggested.

4) *Rue*

Rue (*Ruta graveolens* L.) is a hardy evergreen perennial, a somewhat scrubby plant about eighty centimetres high, with a lax-branched cluster of yellow to yellowish-green flowers. In the garden rue emits a powerful, disagreeable odour. It contains philocarpine, a substance given to horses to induce an abortion.[44]

[40] Galen, *De simplicium medicamentorum*, vi.2.15 (ed. Kühn, xi, p. 854). Galen's *brathu* is probably *Juniperus sabina*.

[41] James Woycke, *Birth Control in Germany, 1871-1933* (London, 1988), pp. 17-18 *passim*; see also V. J. Brøndegaard, "Der Sadebaum als Abortivum", *Sudhoffs Archiv für Geschichte der Medizin und Naturwissenschaften*, xlviii (1964), pp. 331-51.

[42] Prakash, "Potentialities of Some Indigenous Plants", p. 23; see also Prakash *et al.*, "Anti-Implantation Activity", pp. 441, 447.

[43] G. Fredrichs, G. Arends and H. Zörnig, *Hager's Handbuch der pharmazeutischen Praxis*, 3 vols. (Berlin, 1949 [*c.* 1944]), i, p. 1572; Duke, *C.R.C. Handbook of Medicinal Herbs*, p. 256.

[44] Farnsworth *et al.*, "New Antifertility Agents: I", p. 574, based on findings from ten separate studies; the veterinary use of philocarpine is described in *The Merck's Index*, 7th edn., ed. P. G. Stecher (Rahway, 1960), p. 818; Henry de Laszlo and Paul S. Henshaw, "Plant Materials Used by Primitive Peoples to Affect Fertility", *Science*, cxix (1954), p. 629.

This plant is a traditional abortifacient among the Hispanic people in New Mexico,[45] and is used as a tea for abortive purposes throughout Latin America. The report carrying this latter observation also describes experiments on rats that indicate abortifacient activity, but suggests that the "clearest effect is a contraceptive one" in preventing implantation.[46] Modern Chinese, Latin American and Indian medical authorities recognize rue's abortifacient quality,[47] with one manual warning that pregnant women should avoid it because of its emmenagogic properties.[48] Chinese scientists have studied the active substance in a related species, *Murraya paniculata*/var. *M. sapientum* L., in the same family (*Rutaceae*), called *yuehchukene*. This substance is 100 per cent active in preventing pregnancies in rats when administered orally at 2 mg./kg. during the first six days of pregnancy. A single dose at 3 mg./kg. is 100 per cent effective on the first day after coitus. It looks promisingly potent as a future postcoital interceptor.[49]

In his *Herball*, John Gerard (1545-1612) said that rue ought "not be admitted to meat or medicine".[50] Just the same, rue was important to medicine. As with pomegranate, Soranus named rue as an oral contraceptive as well as a vaginal suppository.[51] From the modern evidence it is clear that Soranus' prescription would have had an anti-fertility effect as both a contraceptive and an abortifacient. In sharp contrast to Gerard, Pliny the Elder thought that "rue is among our principal medicines".[52] Pliny said that rue promoted menstruation, brought away the afterbirth and expelled a dead foetus (or embryo), a common circumlocution

[45] George A. Conway and John C. Slocumb, "Plants Used as Abortifacients and Emmenagogues by Spanish New Mexicans", *Jl. Ethnopharmacology*, i (1979), pp. 247-8.

[46] Martha O. Guerra and Amaury T. L. Andrade, "Contraceptive Effects of Native Plants in Rats", *Contraception*, xviii (1978), pp. 191-9, esp. p. 198.

[47] Duke, *C.R.C. Handbook of Medicinal Herbs*, p. 417; M. Terra, *The Way of Herbs* (Santa Cruz, 1980), p. 113; A. Y. Leung, *Encyclopedia of Common Natural Ingredients Used in Food, Drugs, and Cosmetics* (New York, 1980), p. 409; B. S. Malhi and V. P. Trivedi, "Vegetable Antifertility Drugs of India", *Quart. Jl. Crude Drug Research*, xii (1972), p. 1927.

[48] Terra, *Way of Herbs*, p. 113.

[49] Yun Cheung Kong, Jing-Xi Xie and Paul Pui-Hay But, "Fertility Regulating Agents from Traditional Chinese Medicines", *Jl. Ethnopharmacology*, xv (1986), p. 4.

[50] John Gerard, *The Herball: or Generall Historie of Plants* (London, 1636; repr. New York, 1985), p. 268.

[51] Soranus, *Gynaecology*, i.63.

[52] Pliny, *Natural History*, xx.51.131.

for abortion.[53] He contended, just like the modern manual, that "Pregnant women must take care to exclude rue from their diet, for I find that the foetus [*or* embryo] is killed by it".[54] Galen offered a number of anti-fertility uses for rue,[55] among them an oral-route prescription named after Orbanos.[56]

Gargilius Martialis, a retired soldier in North Africa during the third century A.D., described the medical knowledge appropriate to an estate-owner.[57] He gave scant attention to female problems: there is only one mention of contraceptives and abortifacients. Gargilius valued rue, but concluded with a point emphasizing the hazards which might attend its unwitting use by ignorant women: "Some very foolishly declare the damage rue causes: that it inhibits, debilitates the generative seed, and kills embryos in the womb. By itself it does not bring these results; they are due to the people who employ it without considering its strength, its dosage, or the circumstances. Therefore a man [person] of judgement employs it in moderation so that it may not become a poison, rather than a remedy".[58]

Even after Christianity became dominant, late Roman and early Byzantine medical writers continued to relate information about rue's anti-fertility properties. Oribasius called rue an emmenagogue, but the Latin translation explicitly said abortifacient.[59]

[53] *Ibid.*, xx.51.139. Here, as throughout when dealing with sources, I am not making the distinction between embryo and foetus made by modern medicine. Johannes Fischer, *Die Gynäkologie bei Dioskurides und Plinius* (Vienna, 1927), pp. 6-7, observes that Dioscorides used the phrase or one similar to "it aborts a dead foetus" (*ta tethnēkota embrua ektinassei . . . ekballei*): see other examples in Dioscorides, *De materia medica*, iii.32.1.6, iii.32.83.2.1, iii.32.112.2.6-7. In i.78.2.8, the wording is "it kills the foetus" (*embrua phtheiron kai emmēna kinoun*); see also *ibid.*, ii.155.1.3-4. Pliny uses the Latin equivalents of "expelling a foetus" (*embrua kinei . . . agei*, etc.), phrases such as "it drives out also a dead birth" (*partus quoque emortuos pellit, Natural History*, xx.34.86), and "it ejects a faulty birth" (*defunctos partus eicit, ibid.*, xx.54.154).

[54] Pliny, *Natural History*, xx.51.143, trans. Jones, vi, pp. 82, 84.

[55] Galen, *De simplicium medicamentorum*, v.23 (ed. Kühn, xi, p. 777), viii.18 (xii, p. 101); Galen, *De remediis parabilibus*, ii.18-22 (ed. C. G. Kühn, *Opera omnia*, xiv, pp. 480-2); Galen, *De antidotis*, ii.1 (ed. C. G. Kühn, *Opera omnia*, xiv, pp. 114-15), ii.9 (pp. 152-3).

[56] "Antidotos ē Orobanou . . . pros to ta entos brephē ekballein": Galen, *De antidotis*, ii.1 (ed. Kühn, xiv, pp. 109-11).

[57] John M. Riddle, "Gargilius Martialis as a Medical Writer", *Jl. Hist. Medicine and Allied Science*, xxxix (1984), pp. 408-29.

[58] Gargilius Martialis, *Medicinae ex oleribus et pomis*, iii (ed. Valentin Rose, *Plinii Secundi quae fertur una cum Gargilii Martialis medicina*, Teubner., Leipzig, 1875, p. 137); *Materia Medica of Gargilius Martialis*, trans. Ruth Melicent Tapper (Madison, Wis., 1908), p. 26 (available via University Microfilms International).

[59] Above, p. 11 n. 27.

Theodorus Priscianus (*fl.* A.D. 367-83) and Pseudo-Galen's treatise *Ad Paternianum* both said that rue was given to induce an abortion.[60] Paul of Aegina discussed rue in greater detail, seemingly copying from no single source. In discussing gynaecology, Paul outlined a regimen for delayed menstruation or amenorrhoea, since this was preferable, he said, to drugs as a first therapeutic measure. This regimen included exercises and a special diet consisting of a variety of seafood. If the condition persisted, however, for three to four days the woman was advised to drink a soup of shellfish boiled with leeks, pepper and rue. If this failed Paul suggested a vaginal suppository, again containing rue.[61] It should be noted that in his section on pharmacy, however, Paul described rue as a calefacient (warming medicine) and desiccant, and said that it curbed sexual desire: he did not explicitly state that rue was an anti-fertility agent.[62] Guided by Hippocratic theory, however, a physician would nevertheless know that a dessicant quality was needed to dry the sperm in an anti-fertility treatment. From medical writings, such as this one by Paul, even when anti-fertility is not explicitly specified, the physician would have known how to apply the agents according to their qualities — assuming proper training and competency, of course.

Islamic medical writers, such as Rāzi (Rhazes, *c.* 865-925) and Ibn Sīnā, recommended rue as a contraceptive and abortifacient.[63] When Gerard of Cremona (*c.* 1114-87) translated Ibn Sīnā into Latin, he nevertheless made no concessions to the church's position on reproduction, faithfully translating the discussions and recipes for contraception and abortion.[64] In the treatise *On Degrees* (Latin translation by Constantine the African, eleventh century), drugs are prescribed according to the degree of intensity of their pharmaceutical actions, beginning with weak drugs (one degree of activity) and leading up to extremely strong and dangerous

[60] Theodorus Priscianus, *Euporiston*, iii., *Gynaecia*, 6. (*De aborsu*), 23-7 (ed. Valentin Rose, Teubner., Leipzig, 1894); Pseudo-Galen, *Liber de simplicibus medicaminibus ad Paternianum*, in *Galenus omnia quae extant*, 11 vols. in 5 (Venice, 1556), iii, pt. 2, fo. 91^{v}.

[61] Paul of Aegina, *Epitomae medicae*, iii.61.5.1-5 (ed. Heilberg, i, pp. 275-6).

[62] *Ibid.*, vii.3, s.v. *rēganon* (ed. Heilberg, ii, p. 251, ll. 23-7).

[63] Musallam, *Sex and Society in Islam*, pp. 67-70, 84, 146-7.

[64] Ibn Sīnā, *Liber canonis*, trans. Gerard of Cremona, iii.21.8-14, on abortion (ch. 12 entitled "De regimine abortus et extractione fetus mortui"); iii.21.17, on ways to avoid pregnancy which include a suppository with elephant dung. Another way in which contraceptive and abortifacient information was related can be seen in *ibid.*, ii.2, on simple drugs: for example, rue in ch. 578.

drugs which exhibit four degrees of activity. Rue, which displays the strongest of these degrees of intensity, was "drunk with oxymelle to dry out the sperm and kill the desire for intercourse ... [and it] expels the menstrua".[65] This underlines the point about qualities made when discussing Paul of Aegina. In the seventeenth century, moreover, the action of anti-fertility agents could be expressed as "drying" the seed "without adversely affecting lust". William Langham in his *The Garden of Health* (1598) states, for instance, that "Rue eaten a certain space, drieth up natural seede in man", and also that "teeming women may not eate Rue for hindering their conception".[66]

Although rue continues to be employed as an anti-fertility agent in folk medicine, its use in Western medicine was discontinued by the nineteenth century.[67]

5) *Pennyroyal*

Aristophanes' play *Peace* was first produced in 421 B.C. It is a comedy about what was a serious subject for the Athenians who, despite the war with the Spartans, probably packed the theatre, where they heard Hermes tell Trigaius, in need of a companion: "Then on these terms I'll give you Harvesthome/ To be your bride and partner in your fields. Take her to wife, and propagate young vines". Trigaius replies: "O Harvesthome! come here and let me kiss you. But, Hermes, won't it hurt me if I make too free with fruits of Harvesthome at first?". Hermes reassures him: "Not if you add a dose of pennyroyal".[68]

Commenting on this exchange, a Byzantine scholiast explained that pennyroyal (*Mentha pulegium* L.) was used in a medicinal draught that counteracted the effects of eating too much fruit.[69] The scholiast was not too far out. Pennyroyal was used both as a contraceptive and an abortifacient, as Aristophanes' audience

[65] Bayerische Staatsbibliothek, Munich, MS. lat. 267, c. xiv, Constantine the African, *De gradibus*, fo. 128v; also in *Constantini Africani opera* (Basle, 1536), p. 386.

[66] William Langham, *The Garden of Health* (London, 1598), p. 545; see also p. 547: "It is not good ... for women with childe". For a discussion, see Angus McLaren, *Reproductive Rituals: The Perception of Fertility in England from the Sixteenth Century to the Nineteenth Century* (London and New York, 1984), pp. 73-4.

[67] Jonathan Pereira, *The Elements of Materia Medica and Therapeutics*, 2 vols. (Philadelphia, 1854), ii, p. 877.

[68] Aristophanes, *Peace*, 706-12, trans. B. B. Rogers, *Aristophanes*, ii, pp. 64-5.

[69] *Scholia in Aristophanes*, ii, *Pacem*, ed. D. Holwerda (Groningen, 1982), p. 110, scholia 712a; cf. *Scholia Aristophanica*, ed. William G. Rutherford, 3 vols. (London, 1896), ii, p. 111.

knew — otherwise no laughter. Again, in the play *Lysistrata*, Aristophanes produced a *double entendre* when a woman, who was not pregnant (unlike the Athenian Lysistrata), arrived from Boeotia: "A very lovely land,/ Well cropped, and trimmed, and spruced with pennyroyal".[70]

Dioscorides said that pennyroyal was an abortifacient.[71] A late Roman writer, Quintus Serenus (d. A.D. 212), observed that when a pregnancy was less than a month old and the foetus (embryo) was weak, one should "rush into the bedroom" to administer pennyroyal in tepid water to the woman.[72] Other references in classical sources confirm that pennyroyal was used in anti-fertility treatments.[73] Pennyroyal is also recommended in medieval sources as an emmenagogue and/or abortifacient.[74] In the sixteenth century, Langham wrote that the herb, consumed after being soaked in wine, would "provoke the termes and . . . bring foorth . . . dead fruite";[75] while two recent studies of birth-control, one on early modern England, the other on late nineteenth-century and early twentieth-century Germany, report numerous instances of women taking the same plants as their classical and medieval counterparts.[76]

Modern science again endorses our ancestors' practice. Pennyroyal is used in Europe as an emmenagogue and, in 1978, a young woman in Colorado died as a result of taking pennyroyal *oil* to induce an abortion.[77] The plant cannot be legally sold as a drug in

[70] Aristophanes, *Lysistrata*, 87-9, trans. B. B. Rogers, *Aristophanes*, iii, pp. 14-15.

[71] Dioscorides, *De materia medica*, 3.31.1.2.

[72] Quintus Serenus Sammonicus, *Liber medicinalis*, xxxii (ed. R. Pépin, Paris, 1950, p. 34). The text is corrupt at this point: see the edition by Frederic Vollmer, *Quinti Sereni liber medicinalis* (Corpus Medicorum Latinorum [hereafter C.M.L.], ii, fasc. iii, Leipzig, 1916), p. 31. Pépin's text reads: "At qui olim menses minus octo moratus in aluo est/ Inrumpit thalamos et nexus soluit inertes/ Puleium [pennyroyal] ex acido bene conuenit imbre tepenti/ Cuius opem veram casus mihi saepe probarunt". Pépin translates "nexus soluit inertes" as "it loosens the bonds" (*rompt ses liens relâchés*), but to me the sense points to a "weakened one" (*inertes* = embryo/foetus), which is, as we have seen, a circumlocution to justify abortion.

[73] See John Scarborough's excellent article, "Contraception in Antiquity: The Case of Pennyroyal", *Wis. Acad. Rev.*, xxxv (1989), pp. 19-25.

[74] For example, see Pseudo-Apuleius, *Herbarius*, xciii (ed. Ernest Howald and Henry Sigerist, C.M.L., iv, Leipzig, 1927, p. 198); see also the English version of *Herbarius Apulei*, xciv, in *Leechdoms, Wortcunning and Starcraft of Early England*, ed. Thomas Oswald Cockayne, 3 vols. (London, 1864; repr. 1965), i, p. 286.

[75] Langham, *Garden of Health*, p. 478.

[76] McLaren, *Reproductive Rituals*, pp. 73-5; Woycke, *Birth Control in Germany*, pp. 16-19.

[77] "Fatality and Illness Associated with Consumption of Pennyroyal Oil — Colorado", *Morbidity and Mortality Weekly Report*, 22 Dec. 1978, pp. 511-13. Three

(cont. on p. 20)

the United States, but it is employed in modern folk medicine both as an abortifacient and emmenagogue.[78] It is nevertheless true that a twentieth-century European theatre audience in Berlin or London might miss the joke about pennyroyal which apparently entertained the Athenian theatregoer in the fifth century B.C.

6) *Squirting Cucumber*

The squirting cucumber (*Ecballium elaterium* L.) looks rather like the familiar garden cucumber, but has no tendrils. This perennial plant grows on waste ground, verges and cultivated areas. Its leaves are heart-shaped and rough, and the fruit is ovoid-cylindrical, being four to five centimetres long. Despite Freudian suggestions to the contrary, the English name for this plant derives from the fact that when its fruit dries it squirts out its seeds — its anti-fertility use being just coincidental.

A Hippocratic treatise on women's problems claimed that the squirting cucumber was good as "an abortive suppository for the uterus" (*ekbolion husterōn*), and, the author(s) added, "there is nothing that is better".[79] Galen and Dioscorides both described the plant as an abortifacient.[80] Oribasius, Paul of Aegina and Mustio (a gynaecological writer from around the sixth century A.D.) called it an emmenagogue, whereas the later author of a Latin herbal attributed to Apuleius is more specific, saying it is "for an abortion" (*ad abortum*).[81] By the sixteenth century

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pregnant women allegedly read that pennyroyal induced an abortion and took its oil (marketed as an insect repellent and herbal fragrance). One became ill and, after recovering in hospital, was persuaded to undergo a legally induced abortion; the second case was examined and discharged, and there is no further information concerning the outcome of the pregnancy (which was confirmed). The third, lethal case may have been an attempted suicide. Because pennyroyal oil is highly concentrated, its effect would be much more severe than pennyroyal tea. The unfortunate young woman consumed the equivalent of *fifty gallons* of pennyroyal tea. This calculation was made by Norman Farnsworth and communicated to me by Mark Blumenthal (3 May 1990).

[78] Farnsworth *et al.*, "New Antifertility Agents: I", p. 564; Watt and Breyer-Brandwijk, *Medicinal and Poisonous Plants*, p. 523.

[79] *De mulierum affectibus*, i.78 (ed. E. Littré, *Oeuvres complètes d'Hippocrate*, 12 vols., Paris, 1839-61; repr. Amsterdam, 1982, viii, p. 178, ll. 12-14).

[80] Galen, *De simplicium medicamentorum*, viii.18.15 (ed. Kühn, xii, p. 122); Dioscorides, *De materia medica*, iv.150.7.4-5.

[81] Oribasius, *Euporistes*, ii.1.3 (ed. Charles Daremberg and C. Bussemaker, *Oeuvres d'Oribase*, v, p. 635); Mustio, *Pessaria*, ed. Valentine Rose, *Sorani Gynaeciorum vetus translatio latina* (Teubner., Leipzig, 1882), pp. 123-5; Paul of Aegina, *Epitomae medicae*, vii.3, s.v. *elatērion* (ed. Heilberg, ii, p. 209, ll. 6-7); Pseudo-Apuleius, *Herbarius*, cxiv (ed. Howald and Sigerist, p. 199).

Langham was a little less direct, writing that the herb "expel[s] the termes and dead childe".[82] Linnaeus even gave the plant a scientific name from the Greek meaning "abortion", "Ecballium", although the ancient Greek name was *sikus agrios*.

The anti-fertility associations are confirmed by recent animal tests, although they demonstrate contraceptive, not abortifacient, activity. When mice were given daily doses of between 20 and 100 mg./kg. of extracts derived from both the whole plant and the flower alone, they failed to ovulate.[83]

7) *Queen Anne's Lace*

Queen Anne's lace (sometimes known as daucus or the wild carrot: *Daucus carota* L.), has a reddish, slender and strongly aromatic root with stems about two feet high. Both stem and leaves are covered with coarse hair. According to legend, the tiny red specks in flowers of a white to purple cluster are the blood of Queen Anne spilt when she pricked her finger when making lace. Today, women in the Appalachian mountains of North Carolina gather the seeds in the autumn. After coitus, a woman taking a spoonful of the seeds in a glass of water is confident that she will not conceive.[84] Those few women who today know about Queen Anne's lace are heirs to birth-control knowledge which it seems was once much more widespread.

Scribonius Largus (*fl.* A.D. 47) was one of the earliest medical writers to discuss Queen Anne's lace, including it in a recipe designed to induce an abortion.[85] Other ancient writers, such as Galen and Paul of Aegina, also recommended its anti-fertility properties.[86] The Middle Ages learned of its qualities not only

[82] Langham, *Garden of Health*, p. 210.

[83] Farnsworth *et al.*, "New Antifertility Agents: I", p. 549.

[84] Personal interview with Mary Reichle, public health nurse in Watauga County, North Carolina, Aug. 1990.

[85] Scribonius Largus, *Compositiones*, 121 (ed. Sergio Sconocchia, Teubner., Leipzig, 1983, p. 64). Technically the Latin says "after an abortion" (*ex parte abortuve*), but since almost all the recipe's sixteen ingredients (including myrrh, asarum, opopanax and Queen Anne's lace) are abortifacients, I am assuming that either Scribonius simply misunderstood what the women were telling him (or his source) or else that the women misinformed him. There would be no medical grounds for taking the mixture after an abortion, and indeed many good reasons for not doing so!

[86] As an emmenagogue, see Galen, *De simplicium medicamentorum*, vi.4.2-3 (ed. Kühn, xi, pp. 862-3); as an abortifacient, a related species, the death carrot (*thlapsi*), see *ibid.*, vi.8.5 (xi, pp. 886-7). Paul of Aegina, *Epitomae medicae*, iii.61.5.26-8 (ed. Heilberg, i, p. 276), discusses its seeds as emmenagogues, and, in the pharmacy section, gives two listings, *daucus* and *staphulinos*, which are both carrots, and which

(cont. on p. 22)

through classical texts, but also from contemporary writings. For instance, Constantine the African spoke of its very strong emmenagogic qualities: it exhibited the third degree of intensity.[87] In a late Salernitan work dating from the second half of the thirteenth century, Petrus Marancius listed Queen Anne's lace as an emmenagogue, but did not include it among abortifacients.[88]

Queen Anne's lace in fact inhibits implantation. An extract of its seeds exhibits oestrogenic activity, meaning that it is a contraceptive.[89] Following up the observation that rural populations in Rajasthan in India chewed the dried seeds of Queen Anne's lace to reduce fertility, an experiment revealed that dosages varying from 80 mg. to 120 mg. administered to mice between the fourth and sixth days of pregnancy reduced implantation by 100 per cent.[90] Another study shows that seeds from Queen Anne's lace inhibit "implantation, ovarian growth . . . [and disrupt the] estrous cycle".[91] A recent Chinese laboratory test "clearly" suggests that the seed terpenoids block progesterone synthesis in pregnant animals.[92] The drug is judged to have promise as a post-coital anti-fertility agent.[93]

8) *Medieval Contributions to Birth-Control Knowledge*

Medieval scribes modified classical texts to include anti-fertility information that the classical authorities ought to have mentioned,

(n. 86 cont.)
modern authorities consider to be the same plant, *Daucus carrota*: *ibid.*, vii.3, s.v. *daucus*, *staphulinos*.

87 Constantine the African, *De gradibus*: Bayerische Staatsbibliotheck, MS. lat. 267, c. xiv, fo. 123.

88 Petrus Marancius, *Tabulae*, ed. Salvatore de Renzi, in *Collectio Salernitana*, 5 vols. (Bologna, 1852), iv, pp. 564-5.

89 Farnsworth *et al.*, "New Antifertility Agents: I", p. 554; V. P. Kamboj and B. N. Dhawan, "Research on Plants for Fertility Regulation in India", *Jl. Ethnopharmacology*, vi (1982), p. 207; S. K. Garg and G. P. Garg, "Antifertility Screening of Plants, Part VII: Effect of Five Indigenous Plants on Early Pregnancy in Albino Rats", *Indian Jl. Medical Research*, lix (1970), pp. 302-6.

90 M. M. Sharma, Gopal Lal and Dennis Jacob, "Estrogenic and Pregnancy Interceptory Effects of Carrot *Daucus Carota* Seeds", *Indian Jl. Experimental Biology*, xiv (1976), pp. 506-8. From the eighth to the tenth day, however, implantation was not prevented in 61 per cent of the animals. Nevertheless the results show that, as the early sources indicated, the plant is an effective post-coital anti-fertility agent.

91 B. B. Kaliwal, R. Nazeer Ahamed and M. Appaswamy Rao, "Abortifacient Effect of Carrot Seed (*Daucus Carota*) Extract and its Reversal by Progesterone in Albino Rats", *Comp. Physiology and Ecology*, ix (1984), pp. 70-4.

92 Kong, Xie and But, "Fertility Regulating Agents", pp. 18-19.

93 Ashwini Kant, Dennis Jacob and N. K. Lohiya, "The Oestrogenic Efficacy of Carrot (Daucus carota) Seeds", *Jl. Advanced Zoology*, vii (1986), pp. 36-41.

but had not included in their treatises. Inexplicably, Dioscorides had failed to discuss rue's anti-fertility properties, so a medieval scribe in or before the fourteenth century added the phrase: "it discharges the menses and aborts the foetus/embryo".[94] Writing between 1307 and 1311, Peter of Padua added a gloss beside the entry for *asarus* in the Latin text of the Alphabetical Dioscorides. The note comments that it was taken by uninformed people before coitus.[95] Like rue, asarum (*Asarum europaeum* L.) is an anti-fertility agent.[96]

Tansy (*Tanacetum vulgare* L.) is a plant familiar to us, but although it must also have been familiar to the Greeks and Romans there is no word for it in either of their languages. Throughout antiquity tansy wasted its blooms on poets and herbalists who failed to mention it in surviving documents. Presumably for the ancients it had no use, and hence no name. In contrast, Hildegarde of Bingen (1098-1179), abbess of her convent, prescribes tansy as an emmenagogue.[97] Today, tansy is a well-known abortifacient of the ecbolic kind.[98] Tansy is just one example of many contraceptives and abortifacients of which the knowledge is first recorded in the medieval West. Even excluding emmenagogues and abortifacients, Peter of Spain (1226-77), in his *Drugs for Poor People* (*Thesaurus pauperum*), offered 116 prescriptions related to fertility and sexuality: 34 for aphrodisiacs, 26 for contraception and 56 to enhance fertility. Peter was the future Pope John XXI. As Danielle Jacquart and Claude Thomasset observed, it is paradoxical that at a time when the church's stand against abortion

[94] "Kinei dē kai katamēnia, ta de embrua phtheirei": scholia to Dioscorides, *De materia medica*, iii.45 (ed. Wellmann, ii, p. 59); in a fourteenth-century manuscript: Vatican Lib., MS. Palat. 77.

[95] Gloss by Peter of Padua, printed in the Latin Alphabetical Dioscorides published at Colle in 1478, s.v. *asarus*: "The herb asarum . . . which is taken by rustic people before coitus" (*herba ab asaro . . . quem autem sit ante coitum viri ignorari*). There are two entries on asarum in the edition glossed by Peter.

[96] V. J. Brøndegaard, "Contraceptive Plant Drugs", *Planta medica*, xxiii (1973), p. 168.

[97] St. Hildegarde, *Physica*, 111 (ed. Charles Daremberg, Patrologiae cursus completus, ser. ed. J.-P. Migne, ser. lat., cxcvii, Paris, 1855, col. 1174): *reynfan = tanacetum*. The editor has bracketed the passage and raises the possibility of an interpolation, which, in any case, would indicate a medieval discovery. Hildegarde discussed other abortifacient drugs.

[98] Arthur Osol *et al.*, *Dispensatory of the United States of America*, 25th edn. (Philadelphia, 1955), p. 1896; *Taber's Cyclopedic Medical Dictionary*, 6th edn. (Philadelphia, 1954), s.v. ecbolic. A recent report on the use of tansy as an emmenagogue and abortifacient in folk medicine can be found in Conway and Slocum, "Plants Used as Abortifacients and Emmenagogues", p. 257.

and contraception was strong, knowledge of agents capable of acting in this way appears to have been widespread.[99] Albertus Magnus exemplifies the paradox: in his writings on medical lapidaries, Albertus included specific birth-control prescriptions, while at the same time speaking out against birth-control in his theological works.[100]

III

BIRTH-CONTROL: THE SOCIOLOGY OF A KNOWLEDGE

The extent to which women throughout history have known about birth-control is an important but ultimately unanswerable question. Evidence such as that presented here nevertheless makes it reasonable to attribute some knowledge to women. In cases such as Queen Anne's lace, it is equally important to discover why so few women today know what must once have been known by many. In tackling the question of the acquisition of knowledge — of how our ancestors discovered that certain plants affected fertility — we may, however, uncover clues to the answer to the first two questions.

The death carrot (*thlapsi* = *Thlapsia garganica* L.) is related to the wild carrot (Queen Anne's lace) — both are umbellifers — and may have occasionally been confused with it. A drug extracted from the root of the death carrot was given to induce abortions, but, possibly on account of its strength, many ancient physicians omitted it from their list of suitable drugs.[101] The great French botanist, Joseph Pitton de Tournefourt (1656-1708), recorded that he had observed an "old woman doctoress in Salamanca" who administered the death carrot to patients "to bring down the terms", but that the practice was "in great hazard of their lives".[102] How had she acquired this knowledge?

[99] Danielle Jacquart and Claude Thomasset, *Sexualité et savoir médical au môyen age* (Paris, 1985), pp. 126-8 (trans. by Matthew Adamson as *Sexuality and Medicine in the Middle Ages*, Princeton, 1989).

[100] Albertus, *De mineralibus*, ii.2.8, 13 (ed. Auguste Borgnet, *B. Alberti Magni opera omnia*, 38 vols., Paris, 1890-9, v, pp. 39b, 43a); see also John M. Riddle and James Mulholland, "Albert on Stones and Minerals", in *Albertus Magnus and the Sciences* (Toronto, 1980), p. 209; Pamela M. Huby, "Soul, Life, Sense, Intellect: Some Thirteenth-Century Problems", in G. R. Dunstan (ed.), *The Human Embryo: Aristotle and the Arabic and European Traditions* (Exeter, 1990), pp. 115-18.

[101] According to Pliny, *Natural History*, xiii.43.125-6 (possibly *T. arvense* L.); but Dioscorides, *De materia medica*, iv.153, showed no reluctance to relate medicinal usages for the plant.

[102] J. P. de Tournefort, *The Compleat Herbal*, 2 vols. (London, 1719), ii, p. 149.

Discussing this very plant, Theophrastus (d. *c.* 287 B.C.) observed that "The cattle of the country [Attica] do not touch it, but imported cattle feed on it and perish of diarrhoea".[103] Even though Theophrastus did not specifically point to an anti-fertility effect, we can speculate that some people observing the behaviour of cattle were encouraged to experiment. Whether it was during Theophrastus' time, later or before, the historian can probably never know. All we can say with confidence is that by the first century A.D. death carrot was being prescribed as an anti-fertility agent, and that the knowledge that it possessed this quality was not arrived at in the research laboratory of a learned physician. It was learned physicians, however, who acknowledged its effectiveness and recorded it. The woman in Salamanca had probably acquired her knowledge of its properties through a combination of written and oral communication.

In his study of the history of contraception, written in 1936, Norman Himes concluded that oral contraceptives ("potions") in use during the classical period were ineffective and, secondly, that knowledge of the few other contraceptive devices that worked, specifically vaginal suppositories, would have been "confined largely to the heads of medical encyclopedists, to a few physicians and scholars".[104] Recent scholarly opinion on the history of birth-control can be traced back to Himes's study, which was tellingly entitled *Medical History of Contraception.* Himes failed to ask how this élite would have known in the first place what to prescribe for what, if not through the intelligent and critical observation of folk practice that was itself both intelligent and discerning.

The fourth-century Greek physician Oribasius listed as anti-fertility drugs "beaten wormwood, pennyroyal, century plant, thyme, rue *and others which have those qualities*".[105] Clearly he thought that his readers already knew the list. Moreover — as I will demonstrate elsewhere — the substances were pharmaceutically active as he presented them.[106] Similarly, a treatise attributed to Constantine the African, *On Sexual Intercourse*, contains no discussion of contraceptives and abortifacients apart from the

[103] Theophrastus, *De historia et causis plantarum*, ix.20.3 (ed. and trans. Hort, ii, p. 306).

[104] Himes, *Medical History of Contraception*, p. 100.

[105] Oribasius, *Collectiones medicae*, 2 (ed. Mørland, *Oribasius Latinus*, p. 148).

[106] Riddle, *History of Oral Contraceptives.*

intriguing statement that there are medicines "that impede and prohibit the semen and dry it out . . . [There are] cold nutriments that suppress the libido, [and] they are lettuce, purslane, cucumber, beets, mulberry, gourd and melons. There are in truth things that do not generate semen but dry it out and dissipate it on account of heat and dryness, and they are *dill, rue, and similar things*".[107]

There is even some evidence that ancient physicians, all those cited thus far being male, did not fully understand the procedures for taking the anti-fertility agents. In no account, medical or non-medical, is there sufficient detail to permit efficient administration. Medical writers did not normally write in modern "handbook" style. The sixth-century medical writer Aetius of Amida gave this "liquid prescription that prevents pregnancy" (*Pinomenos de kōluei tēn sullēpsin*): "take Cyreniac juice [from *Ferula historica*], opopanax [*Ferula opopanax* Spr.] and rue in equal parts. Prepare by bruising leaves and soaking, and drink the amount of a bean in a mixture of wine and water".[108]

The amount recommended by Aetius at first seems too small to be effective, but the combination of the three anti-fertility plants would indeed have an effect, assuming that the calculation of the amount was within the correct margins, and that the harvesting and preparation were done properly. But as suggested, this sort of information is difficult to find in the medical documents as we have them. Doubtless — because it is difficult otherwise to understand how they could have discovered it — writers such as Aetius relied on what women had told them about amounts, preparations and frequencies. Quantities are rarely specified in the medical writings. The preparation and use of many, perhaps most, of the plant drugs required a large amount of knowledge derived from experience: among the critical factors are the morphological site of extraction, the means of extraction, the type of soil and weather conditions which the plant requires, the time to harvest it, and the amounts and frequencies of administration.[109] Thus knowledge of anti-fertility plants, and how and when to take them, appears from the evidence — scant though it is — to

[107] Constantine the African, *De coitus liber*, in *Constantini Africani opera*, p. 305.

[108] Aetius of Amida, *Iatricorum*, xvi.17 (ed. Zervòs, p. 19). Even though the various prescriptions' ingredients (related on pp. 18-19) are the same as those related by Soranus (*Gynaecology*, i.63), the extra detail would indicate that Soranus was not Aetius' only source.

[109] John M. Riddle, *Dioscorides on Pharmacy and Medicine* (Austin, 1985), pp. xx-xxv *passim*.

belong to a female culture. Some of the medicinal plants were also salad plants. The implication, as illustrated by the remarks quoted above from Pliny and Gargilius Martialis,[110] is that women were eating plants, such as rue and dill, from the same bowl as men who may not even have been aware of what was going on. One must suppose that the women knew what to eat, when and how often, and they would appear not to have learned this through books.

The transmission of such experience would have been most efficient in cultures where the practice of birth-control was acceptable, and would have been more difficult where there was strong cultural and religious resistance. Equally important, when women wanted to be fruitful and did not desire to limit pregnancies, there would understandably be a loss in folk knowledge about the drugs which was the cumulative experience of hundreds of generations.

Obviously the ancients had no controlled laboratory and scientific methodology. They learned through observation of what worked for them and, to some degree, for animals. This type of observation, if rigorously practised, can be a science. Neither the Hippocratic physicians, Soranus, Dioscorides or Galen, nor the hundreds of writers in the Middle Ages who discussed oral and suppository contraceptives, abortifacients and emmenagogues, had themselves made many or perhaps any of the discoveries.[111] In the first century, Dioscorides wrote that the leaves of the white willow tree (*Salix alba* L.) caused "inconception" (*asullemphia*).[112] As we have seen, the first modern scientific study to claim that plant substances have anti-fertility properties, by Skarzynski, concerned the willow; and, in the same year (1933), Butenandt and Jacobi disclosed their findings about the pomegranate. Although I cannot be certain, it seems unlikely to have been sheer coincidence that led modern science initially to select for testing the same plants as were employed in ancient medicine. There may be a connection between what ancient and medieval physicians recorded about folk medicine and what has been rediscovered in recent decades.

[110] See above, pp. 15–16.

[111] John M. Riddle, "Folk Tradition and Folk Medicine: Recognition of Drugs in Classical Antiquity", in John Scarborough (ed.), *Folklore and Folk Medicines* (Madison, 1987), pp. 33-61.

[112] Dioscorides, *De materia medica*, i.104.1.4-5.

IV

CONCLUSIONS

From classical antiquity onwards, we know that some form of birth-control has been practised. Some of the ancients, such as Plato, Aristotle and Polybius, specifically stated that there were ways to control population, but failed to specify the means.[113] In addition, the occasional efforts of the Roman government to increase the birth-rate (or at least the rearing of children) testify that governmental leaders thought that the raising of children needed encouragement and that the issue could be addressed.[114] Musonius Rufus attributed the low birth-rate during Augustus' reign to contraception and abortion.[115] In the second century, Juvenal remarked that "we've so many sure-fire drugs (*medicamina*) for inducing sterility (*steriles facit*)".[116] Similarly, in the medieval period, there are numerous religious, legal and other sources which indicate that contraceptives were not only known, but generally severely discouraged,[117] such as the eighth-century penetential which enquires whether a woman had used a contraceptive.[118]

[113] Plato, *Laws*, v.740.D (ed. R. G. Bury, 2 vols., Cambridge, Mass., and London, 1952, ii, p. 366); Aristotle, *Politics*, vii.14.10 (1335b, ll. 19-26) (ed. H. Rackham, Cambridge, Mass., and London, 1927, pp. 622-4); Polybius, *Histories*, xxxvi.17.5-12 (ed. W. R. Paton, 6 vols., Cambridge, Mass., and London, 1960, vi, pp. 382-4).

[114] The Augustan legislation to increase fertility of 18 B.C. (*Lex Julia de maritandis ordinibus*) and A.D. 9 (*Lex Papia Poppaea*) was followed by the Alimentary Laws that periodically provided, when resources were available between the first and third centuries A.D., cash payments to parents to raise children. See Richard Duncan-Jones, *The Economy of the Roman Empire: Quantative Studies* (Cambridge, 1974), pp. 291-310. Josiah Cox Russell, *The Control of Late Ancient and Medieval Population* (Philadelphia, 1985), pp. 101-76, speaks of the first millennium A.D. as being a period of "population stability". In the second century B.C., Polybius bemoaned a population decline in Greece: Polybius, *Histories*, xxxvi.17.5-12 (ed. Paton, vi, pp. 383-5).

[115] Musonius, frag. 15a (ed. O. Hense, *Musonii Rufi reliquae*, Leipzig, 1905, p. 77); Keith Hopkins, "A Textual Emendation in a Fragment of Musonius Rufus", *Classical Quart.*, xv (1965), pp. 72-4.

[116] Juvenal, *Satires*, vi.595 (trans. Peter Green, *The Sixteen Satires*, Harmondsworth, 1967, p. 149).

[117] John T. Noonan Jr., *Contraception: A History of its Treatment by the Catholic Theologians and Canonists*, enlarged edn. (Cambridge, Mass., 1986), *passim*; additional evidence was gathered by Jean-Louis Flandrin, "Contraception, marriage et relations amoureuses dans l'occident chrétien", *Annales E.S.C.*, xxiv (1969), pp. 1370-90; B. D. H. Miller, "'She Who Hath Drunk Any Potion'", *Medium aevum*, xxxi (1962), pp. 188-95.

[118] Pseudo-Bede, *The Order for Giving Penance*, 30; trans. in Noonan, *Contraception*, p. 156: "Have you drunk any *maleficium*, that is, herbs or other agents so that you could not have children?". Noonan believes that *maleficium* meant a sterilizing drink and probably a contraceptive. *Maleficia* were used with and could apparently be interchanged with *steriles*.

In the introduction we noted that modern scholars have disregarded the testimony of our ancestors concerning oral contraceptives.[119] Confronted with the demographic data, they turn to infanticide[120] and, more recently and related to infanticide, child abandonment,[121] as the factors that supply the best explanation. In contrast, John Noonan, a Catholic canonist and historian, without citing either medical or scientific evidence in support of his case, has argued that the contraceptives must have had some positive effect simply on the basis of their persistence in historical

[119] See esp. Himes, *Medical History of Contraception*, p. 97; Hopkins, "Contraception in the Roman Empire"; J. Knodel and E. van de Walle, "Lessons from the Past: Policy Implications of Historical Fertility Studies", *Population and Development Rev.*, v (1979), p. 227; Ariès, *Histoire des populations françaises*, pp. 494-8, 514-21; P. A. Brunt, *Italian Manpower — 225 B.C.-A.D. 14* (Oxford, 1971), p. 147. For an exception, see McLaren, *Reproductive Rituals*, p. 75: "The efficacy of these contraceptive drugs cannot, however, be totally dismissed".

[120] For the medieval period, P. P. A. Biller, "Birth-Control in the West in the Thirteenth and Early Fourteenth Centuries", *Past and Present*, no. 94 (Feb. 1982), pp. 3-26. During classical antiquity the practice of infanticide — at least on a statistically significant scale — is contested by Donald Engels, "The Problem of Female Infanticide in the Greco-Roman World", *Classical Philology*, lxxv (1980), pp. 112-20; he defends his own position in Donald Engels, "The Use of Historical Demography in Ancient History", *Classical Quart.*, xxxiv (1984), pp. 386-93. For the claim that the evidence for infanticide is sufficiently strong to explain the (rather limited) data, see William Harris, "The Theoretical Possibility of Extensive Infanticide in the Graeco-Roman World", *Classical Quart.*, xxxii (1982), pp. 114-16. For support for Harris's case — at least for classical Athens — see Richard Feen, "Abortion and Exposure in Ancient Greece: Assessing the Status of the Fetus and 'Newborn' from Classical Sources", in William B. Bondeson *et al.* (eds.), *Abortion and the Status of the Fetus* (Dordrecht, 1983), pp. 283-300; Sarah B. Pomeroy, "The Family in Classical and Hellenistic Greece", *Trends in Hist.*, iii (1985), p. 25. See also the survey by William L. Langer, "Infanticide: A Historical Survey", *Hist. Childhood Quart.*, i (1974), pp. 353-65; Ruth Oldenziel, "The Historiography of Infanticide in Antiquity", in J. Blok and P. Mason (eds.), *Sexual Asymmetry: Studies in Ancient Society* (Amsterdam, 1987), pp. 87-107. Those who argue that there was extensive infanticide point to the male/female ratio in the population, which seems to have been higher than that we would expect biologically: see Vern Bullough and C. Campbell, "Female Longevity and Diet in the Middle Ages", *Speculum*, lv (1980), pp. 317-25. In a study conducted in rural areas in Bangladesh, the high ratio of males to females is attributed to high female mortality after the neo-natal period, which probably reflects sex-biased health- and nutrition-related behaviour: see Lincoln C. Chen, Emdadul Huq and Stan D'Souze, "Sex Bias in the Family Allocation of Food and Health Care in Rural Bangladesh", *Population and Development Rev.*, vii (1981), pp. 55-70. This suggests to me that, were there to have been a high male-to-female ratio in classical antiquity, differentials in care are a better explanation than infanticide. I advance this hypothesis mindful of Donald Engels' lament ("Use of Historical Demography", p. 390) that comparing the classical world with modern studies, such as that of Bangladesh, "is fast becoming a nuisance in the writing of classical social and economic history".

[121] John Boswell, *The Kindness of Strangers: The Abandonment of Children in Western Europe from Late Antiquity to the Renaissance* (New York, 1988).

records over long periods of time. More recently David Herlihy has tentatively suggested that some form of effective contraception was used in late medieval Tuscan marriages, on the grounds that married women during the height of their fertile periods had fewer children than expected.[122] This medieval evidence accords with the result of a comparison between paleopathological data from the prehistoric Mediterranean region and preliminary findings from the first century A.D. Studies based on burials at Lerna indicate that forty-seven women (*c.* 1750 B.C.) allegedly averaged five births each, while at Karatas (*c.* 2400 B.C.) 164 women averaged four births.[123] These relatively high numbers contrast sharply with a study of the women who died in A.D. 79 at Herculaneum, who averaged only 1.81 births each.[124] This evidence is not as "hard" as it appears, because there is some question whether the number of times a woman gave birth can be so precisely and consistently revealed through the count of lesions (dorsal pits) near the symphyseal border on female pubes indicating the number of parturitions.[125] The fact that the women at Herculaneum all died at the same time, some without having experienced a full life of pregnancy vulnerability, needs also to be taken into account.[126] Just the same, when taken with the other material, such as demographic, medical, legal, theological and other literary records, the evidence is against infanticide as the primary factor

[122] David Herlihy, *Medieval Households* (Cambridge, Mass., 1985), pp. 146-9.

[123] J. Lawrence Angel, "The Bases of Paleodemography", *Amer. Jl. Physical Anthropol.*, new ser., xxx (1969), p. 433.

[124] The data are forthcoming in S. Bisel's study of the skeletons of women who died at Herculaneum, described by Ann Hanson, "Greco-Roman Gynecology", *Soc. for Ancient Medicine and Pharmacy Newsletter*, xvii (1989), p. 89.

[125] D. Gentry Steele and Claud A. Bramblett, *The Anatomy and Biology of the Human Skeleton* (College Station, Texas, 1988), pp. 202-4. One study has found that while there is a statistical association between the number of marks or lesions and full-term pregnancies, the "correlation is not strong": Judy Myers Suchey *et al.*, "Analysis of Dorsal Pitting in the *Os Pubis* in an Extensive Sample of Modern American Females", *Amer. Jl. Physical Anthropol.*, new ser., li (1979), pp. 517-40. Another study concludes that the parturition number cannot be more precisely stated than as indicating those women who had full-term pregnancies and those who did not: Marc A. Kelley, "Parturition and Pelvic Changes", *Amer. Jl. Physical Anthropol.*, new ser., li (1979), pp. 541-5.

[126] J. Lawrence Angel's studies show that during the earlier classical age of Greece women averaged 4.3 births. Based on the typical age at marriage (14-15) and the fact that the skeletal remains indicate an average of lifespan of 36.2 years, one might expect each woman to have had five or six children. See Sarah B. Pomeroy, *Goddesses, Whores, Wives, and Slaves* (New York, 1975), p. 68. In comparison, the average number of children born to married women in France between 1550 and 1599 was 6.53: see Barbara A. Hanawalt, *The Ties that Bound* (Oxford, 1986), p. 217.

influencing demographic data, because of the paucity of evidence attesting its widespread usage. If there is so little evidence for infanticide, it is unlikely that it was very common. On the other hand, there is abundant testimony to chemical birth-control measures.

Were contraceptives and early-term abortifacients a significant part of birth-control? Can such birth-control account for the indications of planned parenthood in fifteenth-century Florence, or the low fertility of first-century Romans, or of the inhabitants of fifth-century Constantinople? A series of anthropological-historical studies from Nigeria, China, Korea, the Soviet Union, Haiti, New Mexico, Paraguay, Egypt, Malaysia and India reveal that present-day traditional societies employ a variety of anti-fertility agents.[127] If modern populations can regulate their fertility by plant drugs, surely so could pre-modern societies, as there is strong evidence that similar methods and agents were being used.[128]

The findings of modern medical science and anthropology enable us to believe the testimony of historical documents con-

[127] For Nigeria, see D. D. O. Oylebola, "Yoruba Traditional Healers' Knowledge of Contraception, Abortion, and Infertility", *East African Medical Jl.*, lviii (1981), pp. 777-84; for China, Kong, Xie and But, "Fertility Regulating Agents", pp. 1-44; for Korea, J. O. Kokwaro, "A Review of Research on Plants for Fertility Regulation", *Korean Jl. Pharmacognosy*, xii (1981), pp. 149-52; for the Soviet Union, V. V. Kharkhov and M. N. Mats, "Pasteniia kak potentsial'nye istochniki protivozachatochnhkh sredstv" [Plants as a Potential Source of Contraceptive Drugs], *Rastite'nye Resursy*, xvii (1981), pp. 293-9; for Haiti, B. Weniger, H. Haag-Berrurier and R. Anton, "Plants of Haiti Used as Antifertility Agents", *Jl. Ethnopharmacology*, vi (1982), pp. 67-84; for New Mexico, Conway and Slocumb, "Plants Used as Abortifacients and Emmenagogues", pp. 241-61; for Paraguay, P. Arenas and R. Moreno Azorero, "Plants Used as Means of Abortion, Contraception, Sterilization and Fecundation by Paraguayan Indigenous People", *Econ. Botany*, xxxi (1977), pp. 302-6; for Egypt, K. C. Tiwari, R. Majumder and S. Bhattacharjee, "Folklore Information from Assam for Family Planning and Birth Control", *Internat. Jl. Crude Drug Research*, xx (1982), p. 133; for Malaysia, Carol Laderman, *Wives and Midwives: Childbirth and Nutrition in Rural Malaysia* (Berkeley, 1983), esp. p. 78; for India, R. C. D. Casey, "Alleged Anti-Fertility Plants of India", *Indian Jl. Medical Sciences*, xiv (1960), pp. 590-600.

[128] In an extensive recent survey of birth-control methods conducted by the World Fertility Survey (W.F.S.) and the Contraceptive Prevalence Surveys (C.P.S.), women who replied to the question about contraceptive use and said that they took herbs, were placed in the category, "Not using". The result was that as many as 93.5 per cent of the women in Bangladesh and as few as 33.2 per cent in Costa Rica were categorized as non-users of contraceptives!: John E. Anderson and John G. Cleland, "The World Fertility Survey and Contraceptive Prevalence Surveys: A Comparison of Substantive Results", *Studies in Family Planning*, xv (1984), p. 7. The blind neglect of traditional medical remedies in this survey is in stark contrast to the World Health Organization's call for the study of such medicines.

cerning the use of plant substances for birth-control. Right up to the twentieth century women have held that they had a right to take contraceptive and menstrual regulators, even when it aborted pregnancy, provided it was before the foetus moved or quickened.[129] What they did — as they tell us — was to take drugs and to be as careful as possible. Since we are willing to trust in the reliability of their testimony concerning the caution, we should be equally willing to do so when it comes to the drug-taking.

North Carolina State University *John M. Riddle*

[129] McLaren, *Reproductive Rituals*, p. 107.

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COVER ARTICLE

Botanical Determination of the Middle Eastern Tree of Life

J. Andrew McDonald

Now that man has become like one of us in knowing good from evil, he must not be allowed to reach out his hand and pick from the tree of life too, and eat and live forever! . . . (so god) banished the man, and in front of the garden of Eden he posted the great winged creatures and the fiery flashing sword, to guard the way to the tree of life.

(Genesis 2:21–24)

Early myths and religious beliefs that account for the origin of life and human aspirations to attain immortality are often ignored or scorned by natural historians, as they tend to contradict modern Darwinian views of natural creation and current biological understandings of the aging process. Allusions to an immortalizing 'tree of life' in the mythic traditions of Mesopotamia, the Levant, and India are therefore thought to arise from the hopeful and imaginative yearnings of superstitious peoples rather than historical realities. Linguists and comparative mythologists have long recognized, nevertheless, that references to such a plant appear recurrently in mythic, artistic, and historical records of Indo-European, Semitic and Hamitic peoples (Campbell 1991:9–17; Cook 1974; James 1966:129–162; Parpola 1993). This observation convinces some commentators that ancient beliefs in an immortalizing 'plant of the gods' may have a material or logical basis in human history. Some historians have hypothesized that the concept of a tree of immortal life derives from the widespread practice of ingesting psychotropic plants to heighten or distort human perceptions of reality (Ruck 1986; Ruck, Staples, and Heinrick 2001; Schultes 1992; Smith 2000; Wasson 1986). Whether this is this is the case or not, no single plant has ever been identified that could have served the same purpose for so many different peoples throughout Europe and Asia.

Sacred Trees in the Visual Arts

Visual renderings of a symbolic 'tree of life' in the arts of the Near and Middle East from the 3rd–1st millenium BCE portray a plant whose physical attributes are generally consistent with mythical traditions of the region. They depict a pillared plant that grows from an aquatic medium or world-mountain toward the image of a sun (Fig. 1a, c–e; Danthine 1937, Fig. 139, 176, 254, 691–696). This plant is often illustrated in a narrative context, usually in association with a host of divine human figures, snakes, eagles, lions, bulls, or leogryphs. Early depictions of the motif on cylinder seals from the 3rd millenium BCE are usually too poorly preserved or stylized in their execution to allow for a botanical interpretation (Frankfort 1939, Pls. 4j, 13e, h; Parpola 1993), but later interpretations of the plant during the late 2nd millenium BCE are increasingly amenable to botanical scrutiny. Renderings that date from the 1st millenium BCE allow, in fact, for a species determination. Since late portrayals of the plant are normally regarded as refinements on earlier interpretations (James 1966; Parpola 1993), it is reasonable to assume that a botanical assessment of later materials is relevant to those of older origin.

Two distinctive forms of this mystical 'world-tree' are preserved on cylinder seals from the 2nd millenium BCE. One basic tree type is portrayed as a columnar plant that supports a luminescent object (Fig. 1a); another is depicted as a ramified, monopodial treelet (Fig. 1b, d). The former type presents a naked trunk that is generally lacking of lateral branches, save for a pair of opposing horn-like offshoots at the apex of the plant which most art historians are inclined to interpret as a crescent moon. In like manner, a radiate structure that is cradled by the plant's horizontal crescent is normally interpreted as a solar, lunar or astral motif (Fig. 1a; Danthine 1937, Fig. 188, 189, 438, 497, 498, 502–504).

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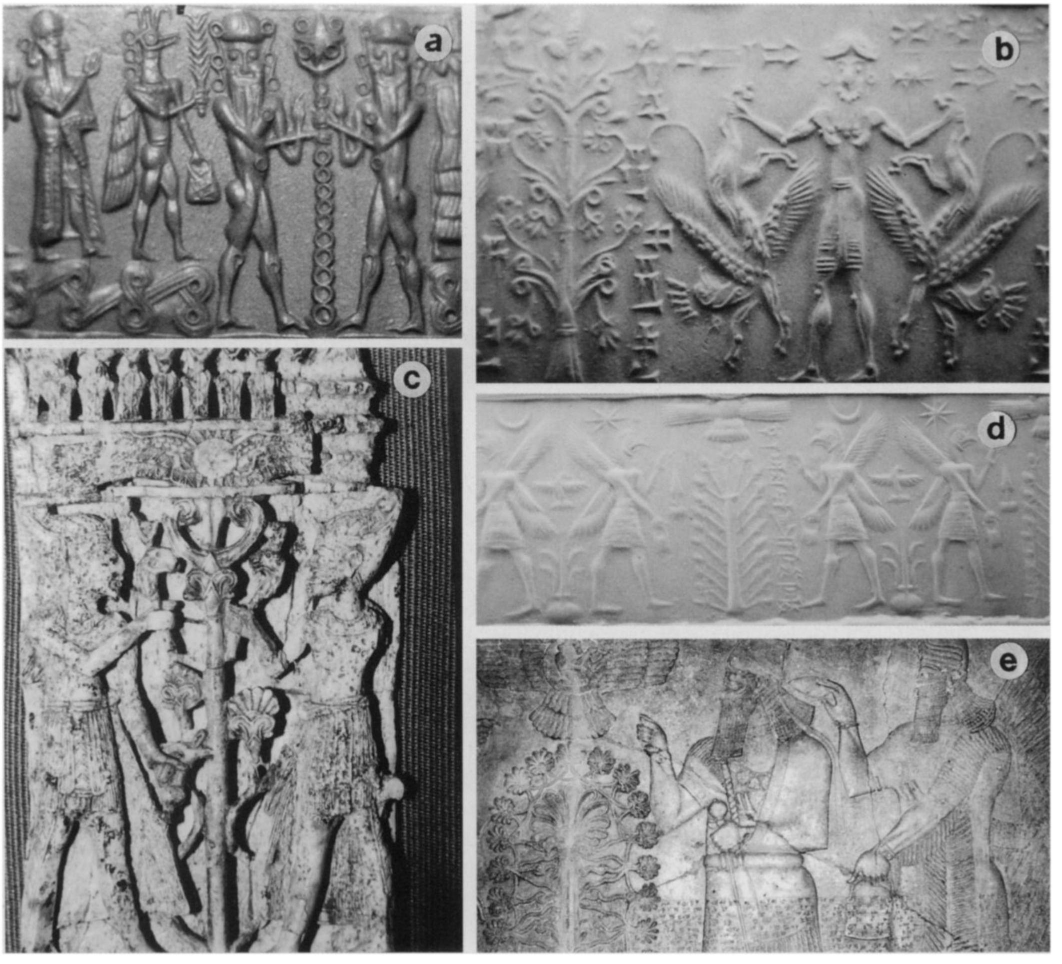

Fig. 1. a–e. Historical depictions of the Mesopotamian and Levantine sacral tree. **a.** Two heroic figures uphold a sacral tree while a quasi-personified griffin emerges from a watery substrate to sanctify the plant with a bucket and branch. An ascending pair of serpentine stems supports a crescent moon (horns or branches?) and tetramerous sun (or flower?). Mitannia. 1350–1250 BCE (Louvre Museum). **b.** A divine man subdues two griffins that once roosted in the tree of life. The monopodial tree produces a series of opposite branches that terminate in volutes. Floral shoots depicted as stylized 'palmettes' grow from the axils of lateral branches and a strobilus is held erect at the apex. Mitannia. 1350–1150 BCE (Boston Museum of Fine Arts). **c.** Two divinities (or priests?) stand before a pillared, blue-pigmented tree of life. Lateral branches produce lotus blossoms in the form of stylized palmettes. Note that the central axis supports a horned structure and a winged disk. Two volutes and a deltoid appendage subtend the tree's apex and each palmette, these features suggesting the profile of a tetramerous flower. A series of cobras stand guard over the tree, each supporting a moon and solar disk upon their head. Note that the diadem of the serpents mirror the image of the sacral tree's crown. Phoenician craftsmanship at Nimrud (Kalakh), Iraq. 9–8th BCE (British Museum). **d.** Personified griffins stand before a budding or fruiting sacral tree with buckets in hand. The symbol of the sun or a sun-god, the winged disk, illuminates the plant. Mesopotamia. 883–614 BCE (Boston Museum of Fine Arts). **e.** King Assurnasirpal stands before a sacral tree while a winged genius anoints him with a bucket and cone. A sun-god known as Shamash or Assur is observed emerging from his solar disk to witness the sanctification of the sovereign. Palace of Assurnasirpal II, Nimrud, Iraq. 883–859 BCE (British Museum).

As a whole, this highly stylized motif is thought to symbolize a vegetative entity that governs solar and lunar cycles, the changing of seasons, and annual cycles of plant growth.

This image is often associated with a host of divine human figures, one prevailing form of which is rendered with a naked body, elongated face, broad nose, curly tresses, a beard, and rounded crown (Fig. 1a, b). This man is often accompanied by a variety of animalian spirits and fully robed anthropomorphic gods and goddesses, the latter of whom tend to congregate about the sacred plant to pay homage, often in association with aquatic environments (Fig. 1a; Danthine 1937, Fig. 139, 176, 254) or upon the tree's cosmic mountain (Danthine 1937, Fig. 502, 624, 625, 683, 691–695). The predominant naked figure often subjugates lions, bulls and leogryphs by hoisting the mythical creatures into the air by their hind legs or tails (Fig. 1b, 5c). While the underlying meaning of this bold posture is still not fully understood, it seems to relate in some way to the gaining of access to the sacred tree (Fig. 1a, b, d, e, 2d, 5a, b). In like manner, the subordinate animals appear to play a dualistic role in Middle Eastern iconography, as either protectors or devotees of the divine plant. In the latter capacity they conventionally carry a short-handled pail (or purse?) in one hand and a vegetative motif in the other (Fig. 1a, d, e). They perform an act of consecration that historians are given to interpret as an 'anointing,' 'smearing' or 'watering' of the sacral tree (Black and Green 1992:16, 170; Frankfort 1939:204, 1989:160–162; Goldsmith 1928: 101).

These same mythical figures congregate around a cosmic tree that produces opposite, tiered offshoots (Fig. 1b–e, 2a). Lateral branches of this sacred tree often bear stalked palmettes in their axils (Fig. 1b, c, e, 2d, 5a, b) and stylized hooks, volutes, fruits or cone-like structures at their tips (Fig. 1b, c, d, 2d, 4a, b; see also Black and Green 1992:80; Danthine 1937, Fig. 380, 407, 409–412, 580). This particular tree is clearly distinguished on a morphological basis from its pillared and branchless counterpart, yet historians are inclined to recognize it as a variant rendering of the branchless tree (Fig. 1a), as we occasionally encounter hybrid motifs that exhibit vegetative nuances of both tree types (Parpola 1993, appendix A, pp. 200–201). Moreover, we observe the same bizarre sphinxes and personified griffins performing the same unusual rites on both motifs (Fig. 1a, d, 2d, 5b).

By the middle of the 1st millenium BCE we note that the sacral tree has undergone few changes, as the plant still exhibits a naked, columnar trunk, a palmate canopy, and close contacts with the sun, winged humans, or various animalian spirits (Fig. 1e, 2a, c, 5b). Though still stylized at this late date, some of the plant's vegetative features are now executed with increasing realism, as exemplified by the sacral trees of Assurnasirpal II at Nimrud and Nineveh during the 9th c. BCE (Fig. 1e, 2a). These large (1–2 m tall) and detailed interpretations of the archaic tree can be traced from wall paintings of the same motif at Kar Tukulti-Ninurti during the 12th century BCE (Frankfort 1989; Fig. 152, 153), and match closely to renderings of the tree on ivory fragments of contemporaneous age (Fig. 1c, 2d, 5b). A general consensus has been reached that all of these vegetative motifs are symbolic of power, fertility and everlasting life, yet there is little agreement as to how the images relate specifically to religious beliefs and myths of Mesopotamia and the Near East (Parpola 1993).

Archeologists and art historians often identify these motifs as stylized date palms (Fig. 2a), owing primarily to the plant's palm-like aspect and to the importance of dates in the diets and local economies of Middle Eastern cultures (Danthine 1937; James 1966:98; Mazar 1961, 4:71; Parpola 1993; Porter 1993; Tylor 1890). Other commentators prefer, however, to refer to these symbolic images as 'pillars of heaven' (Frankfort 1939:276; 1989:248, 296), 'palmetto trees' (Keel and Uehlinger 1998:199, 234), or 'Cypriote palmettes' (Frankfort 1989:323), so as to emphasize their magical significance. Labels of the latter type are often used, for example, in reference to sacral trees that are encountered on reliefs inside Assurnasirpal's temples during the 9th century BCE (Fig. 1e, 2a), since the general appearance of these executions do not suggest the image of a date palm per se. While Assurnasirpal's trees do possess a pillared trunk and palmate canopy, we note that a series of small palmettes surround the tree in an array that is inconsistent with palm morphology. The small palmettes are linked by smooth and pliable stems that tie off directly to the plant's pillared axis, ostensibly to establish a visual relationship between the repeating palmettes and the sacral

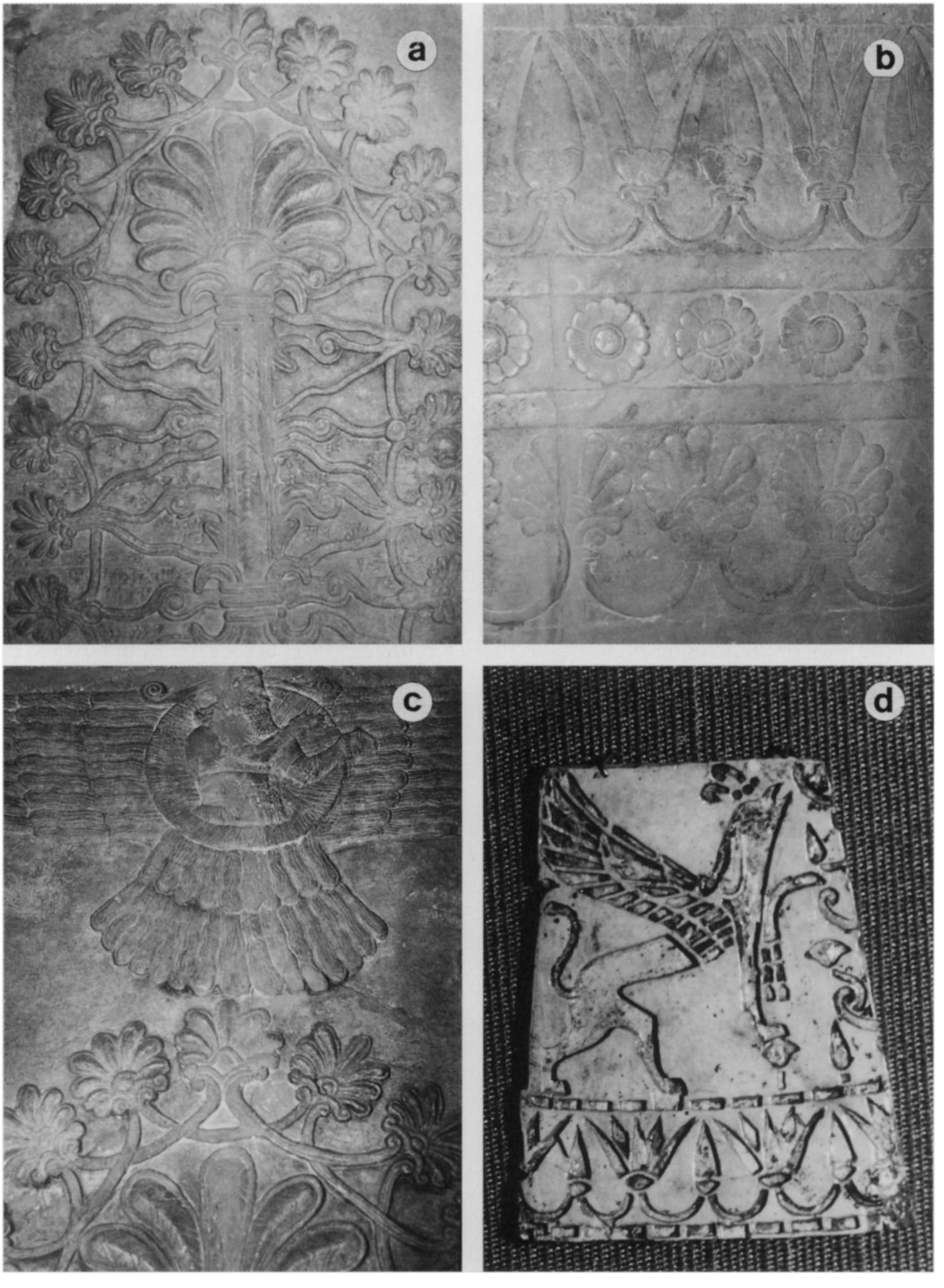

Fig. 2. **a–d.** The Lotus as a 'Pillared Palmette.' **a.** Assurnasirpal's sacral tree normally exhibits a columnar trunk and the profile of an apical rosette (i.e., the classical 'palmette'). The surrounding palmettes match closely with the tree's crown and are linked by a pair of serpentine stems. Extensions of the stems tie off to the plant's central axis. Nimrud, Iraq. 883–859 BCE (British Museum). **b.** A door panel of Assurnasirpal's palace equates a series of palmettes with a running link of lotus blossoms. Radial views of the solar flowers are portrayed as rosettes. Alternating bud-and-blossom motifs symbolize the natural process of rebirth and the metaphysical concept of immortal life. Nineveh, Iraq. 704–681 BCE (British Museum). **c.** A solar god emerges from the symbol of the sun—a winged orb—to give life to the sacral tree. Nimrud, Iraq. 883–859 BCE (British Museum). **d.** A crested griffin stands upon a lotus flower and reaches toward the tree of life. Branches of the immortalizing plant support alternating lotus buds and blossoms (a symbol of eternal recurrence) and reflect the image of a running bud-and-blossom motif at the base of the tree. Residues of blue pigments remain on the flower's petals and the griffin's wings. Nimrud, Iraq (of Phoenician origin). 9–8th c. BCE (British Museum).

tree's canopy (Fig. 2a, c). We also note that the cluster of appendages that comprise each palmette do not suggest the morphology of a date palm's pinnate blades (Fig. 3a), but rather a simple, narrowly elliptical, foliaceous structure (Fig. 1c, e, 2a, b, 4d, f, 5b, 6a). Hence one is hesitant to identify the plant's palmate spray of 'leaves' as a palm canopy. To further question this association, we note that the ropy stems of the plant occasionally give rise to a peculiar fruit that bears no resemblance to a date (Fig. 4b, d, f; Danthine 1937: Fig. 426, 428, 431, 440, 448). On other occasions the stylized bower produces a series of stylized strobiloid structures (Fig. 1b, 6a–c; Danthine 1937, Fig. 380, 407, 409–412, 482, 490, 580, 821; Loud 1939, Pls. 20, 21), which art historians are apt to identify as 'cones', 'pine-cones', or 'pineapples' (Black and Green 1992:46; Menant 1888:64, Pl. VIII,X; Parpola 1993:183). These recurrent features are also discordant with physical attributes of a date-palm.

Assurnasirpal's trees maintain a close symbolic association with the sun, but at this point in time the solar orb is removed from the boughs of the plant and placed above the motif in the form of a winged disk (Fig. 1e, 2c). A divinity that emerges from the center of the winged orb is normally interpreted as one of various sun-gods that were worshipped by the Sumerians, Akkadians, Assyrians, Babylonians and Perso-Aryans, known variously as Utu, Shamash, Assur, Marduk or Ahura Mazda (Black and Green 1992:129, 182–184, 186). It has proven difficult, however, to identify which of these gods is depicted specifically in Assurnasirpal's palaces at Nimrud and Nineveh, since the same winged-sun motif has been employed by many and various cultures throughout the fertile crescent from the 3rd–1st millenia BCE. Furthermore, all of the aforementioned divinities share close mythic and iconographic affinities with an immortalizing tree of life (see below).

Although we occasionally encounter the unmistakable image of a date palm on temple reliefs and cylinder seals that commemorate historical scenes [i.e., as deduced by their columnar trunks, persistent leaf bases, pinnate leaves, and spathate inflorescences (Fig. 3a; see also Danthine 1937, Fig. 13, 14, 18, 19, 25–27; Roaf 1998:189, 190)], images of date palms are only rarely associated with mythical scenes (Danthine 1937, Fig. 15, 16, 20, 24, 31, 34). Religious and fantastical scenes usually employ a highly stylized interpretation of the world-tree, which, as earlier noted, is often surrounded by an arching network of supple, succulent stolons (Fig. 1b, e, 2a, c, d, 4d, f, 5b, 6c). Or more importantly, we notice that the sacral tree's palmettes are frequently drawn across a horizontal plane (Fig. 2b, d, 4d, f, 6c), in which arrangement they seem to suggest a floral motif rather than a branching canopy. This specific association is clearly implied on a stone panel that once decorated a doorway of Assurnasirpal's chambers (Fig. 2b), where horizontal alignments of repeating palmettes are unequivocally equated with a lotus bud-and-blossom motif.

The frequent association of lotus blossoms and palmettes in the visual arts of the Middle East is of critical importance for several reasons. First, the classical lotus bud-and-blossom motif that we encounter in Egypt as early as 3000 BCE and in Mesopotamia by the second millenium BCE is widely recognized as a symbol of rebirth and immortal life. Hence the symbolic inference of a sequential bud-and-blossom motif agrees conceptually with the metaphorical concept of an immortal 'tree of life'. Secondly, we note that Mesopotamian palmettes are usually subtended by a pair of lateral volutes with a deltoid or rounded appendage fixed between them (Fig. 1c, 2a, c, 5a, b, 6c). This conventional feature of a palmette suggests that we are not dealing with a palm canopy, but rather a tetramerous, polypetalous flower that displays three of its four sepals in profile (Fig. 2b, 3d, 4a, 5c, 6b). If this is the case, then we are compelled to identify the 'sacral tree' of Mesopotamia as a stylized lotus shoot rather than a palm tree, for flowers of the Egyptian lotus (*Nymphaea nouchalii* Burm. f.; = *N. caerulii* Savigny *pro syn.*; Verdcourt 1989) are large, tetramerous, and solitary (Fig. 3c, d). In contrast, flowers of a date palm are miniscule, hexamerous, and born numerously on a highly ramified, spathate inflorescence (Fig. 3a). Hence it follows that the columnar axis of the sacral tree does not represent the woody trunk of a date palm (Fig. 3a), but rather an upright, naked, succulent lotus stalk (Fig. 2c, d, 3c, d, 4e).

Mesopotamian artisans often placed stalked palmettes in the hands of dignitaries and enthroned kings on temple reliefs (Danthine 1937, Fig. 904–908, 914, 924, 1095; Frankfort 1989, Fig. 231, 358; Mazar 1961, II:143, 270; Roaf

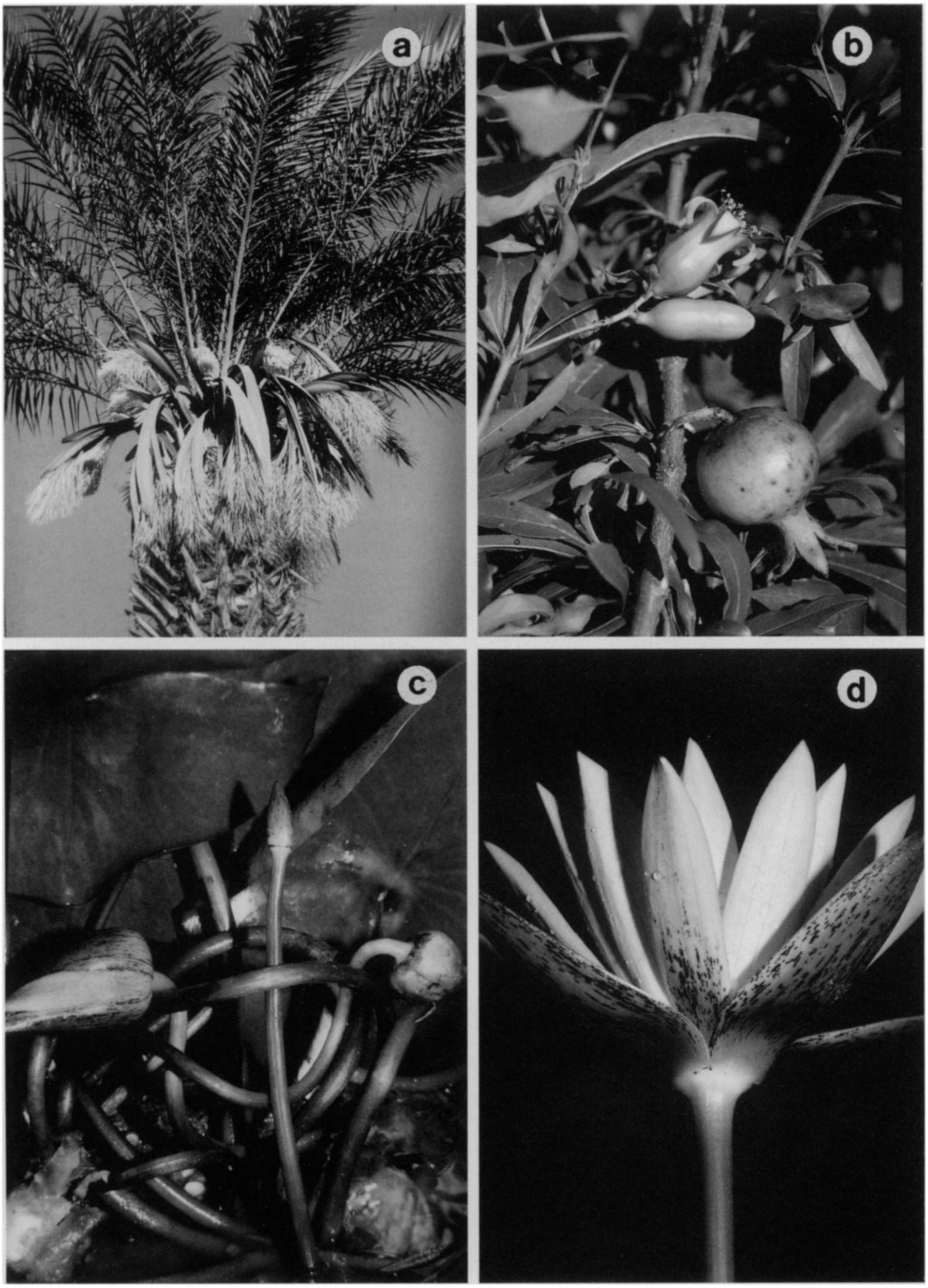

Fig. 3. a–d. Plants identified with the Symbolic Tree of Life. **a.** Growth habit of a flowering date palm (*Phoenix dactylifera*). Note the persistent leaf bases on a broad, woody trunk, pinnately compound leaves, dangling spathes and highly ramified flowering stalks. **b.** Flowering and fruiting stalks of a pomegranate (*Punica multiflora*). Note that the flowers and fruits are born on thin, foliaceous, ramified, woody stems. **c.** Growth habit of the 'Egyptian lotus' or 'Lily of the Nile' (*Nymphaea nouchalii*). Note that the plant produces a succession of solitary flowers born on thick, naked, succulent stems. The budding stalks suggest the image of a rising serpent when they emerge from the water. Fruiting stalks recoil in a serpentine manner as they retract their pollinated flowers back into the water. **d.** The 'Egyptian lotus' displays four outer sepals and numerous azure petals when in bloom. Note that the flowers are always born singly at the apex of a thick, succulent shoot.

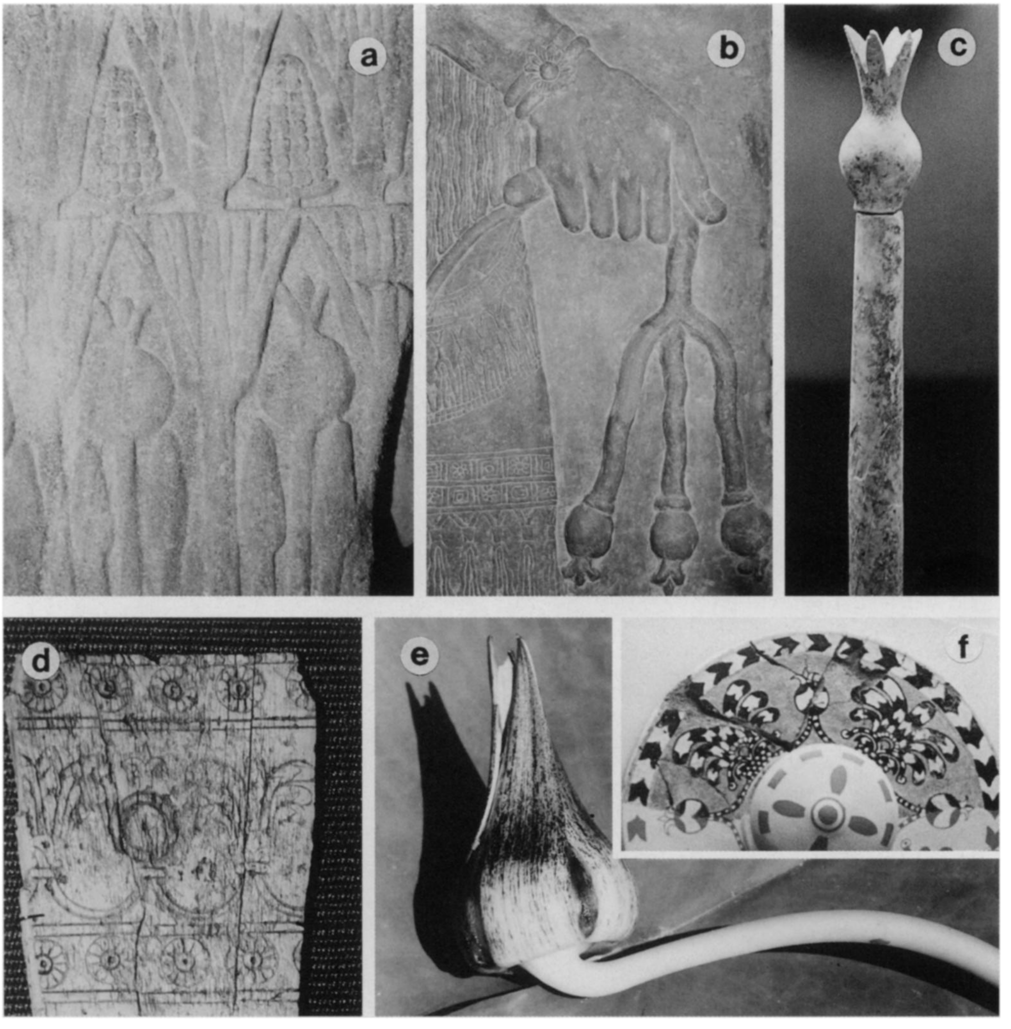

Fig. 4. a–f. The fruit of the immortalizing tree of life. **a.** Stylized lotus fruits are integrated into a lotus bud-and-blossom motif on an offering table that was dedicated to the sun-god Amun at Karnak. Thebes, Egypt. 9th c. BCE (British Museum). **b.** A priest carries three lotus fruits while a king (not seen) leads the way with three lotus flowers in hand (Frankfort 1989, Pl. 199). The supple, succulent stems of the fruits suggest the image of a lotus peduncle rather than a pomegranate stem. Khorsabad (Dur Sharrukin), Iraq. 8th BCE (Louvre Museum). **c.** Ivory scepters fashioned in the image of the fruiting lotus shoots are frequently uncovered in archeological zones of the Near East. The rod presumably symbolizes fertility and the vital powers of the king. Fosse Temple, Lashich, Israel. 14th c. BCE (British Museum). **d.** Numerous ivory pieces that once decorated palace furniture of Assurnasirpal present a running lotus flower-and-fruit motif. Nimrud, Iraq. 8th c. BCE (British Museum). **e.** Fertile shoots of the Egyptan lotus exhibit succulent stems, a swollen ovate fruit, and clasping, accrescent sepals. **f.** A glazed wall plaque displays bluish palmettes that alternate with a lotus fruit. Nimrud, Iraq. 8th c. BCE (British Museum).

1998:171, 178), in which context historians are inclined to identify them as flowering lotus shoots. We also note that paintings and ivory carvings of palmettes were intentionally rendered in blue by the use of lapis lazuli stone insets or pigments made from crushed azurite and oxides of copper (Fig. 1c, 2d, 4f; Parrot 1961:266). Since flowers of the Egyptian lotus are blue-pigmented, and those of a date palm cream-colored, we may be sure that the palmettes were intended to represent a stylized lotus flower.

Fig. 5. a–d. Egyptian influences on Mesopotamian iconography. **a.** Mythic motifs on a silver Phoenician bowl integrate Egyptian and Near Eastern motifs. A personified image of an Egyptian sun-god (Horus/Harpocrates) is seen arising from a lotus flower that sprouts beside a sacral tree. The tree produces stylized lotus buds and flowers on its lateral branches. Cyprus. 7–8th c. BCE (British Museum). **b.** A ram-headed sphinx strides across a lotus grove as he approaches a lotiformed tree of life. Although this winged caprid resembles the Egyptian sun-god known as Khnum, he symbolizes a Near or Middle Eastern divinity. Note that the chimera

Numerous ivory engravings and figurines of Phoenician origin lend credence to a floral interpretation of the sacral tree's palmettes. An exemplary specimen from Assurnasirpal's palace at Nimrud portrays, for example, a winged sphinx striding across a lotus bud-and-blossom motif as he approaches a tree of life (Fig. 2d). Although this damaged fragment does not provide a clear view of the plant's pillared trunk, we do observe the conventional hooked branches of the sacral tree. We also pay heed to alternating lotus buds and flowers that sprout from the tips of lateral shoots (Fig. 1c, 5a, b; see also Danthine 1937 for hundreds of examples, and Mazar 1961, II:214, 215 for examples from Samaria and Megiddo, Israel). We note that the griffin has placed one forepaw upon a full-blown lotus flower as he extends another protective paw toward a blue-pigmented lotus bud on the sacred tree. Hence the upwardly mounting, stylized buds and blossoms on the tree clearly mirror the image of a lotus bud-and-blossom motif that runs along the lower border of the fragment.

The symbolic equivalency of the palmette and lotus blossom is further implied by placing alternating images of a solitary fruit between each flower (Fig. 4a, d, f; D'Alviella 1956, Fig. 63, 64, Pl. IV). This fruit is consistently rendered with an ovoid pericarp and persistent, clasping sepals. While art historians and botanists are inclined to identify the fruit as a pomegranate, *Punica multiflora* Hort. (Avigad 1990; Halpern 1992; Keel and Uehlinger 1998:360; Moldenke and Moldenke 1952:191–192), there is ample reason to question this determination. For one, pomegranates share no ecological relationship with date palms in the natural world, except for the fact that they are both semi-domesticated species. Secondly, pomegranate plants share few, if any, morphological characteristics with a palm tree (Fig. 3a, b). Finally, we note that fruits of the sacral tree are often incorporated into stylized configurations of palmettes and lotus motifs in Mesopotamia (Fig. 4d, f) and Egypt (Fig. 4a), suggesting that the fruit may share a symbolic relationship with water lilies. Indeed, an Assyrian dignitary that dangles a cluster of three sacral fruits (Fig. 4b) is preceded on the same relief by a king that holds three lotus flowers in hand (Frankfort 1989, Fig. 199; see also Danthine 1937, Fig. 119, 914). This historical scene confirms that Mesopotamian artisans recognized some sort of biological or symbolic relationship between the stylized fruit and lotus flower in religious rituals.

Indeed, if we consider the peculiar morphology of the distinctive fruit, we recognize that the fruiting body is more readily identified as a lotus berry than a pomegranate, since ovoid *Nymphaea* berries are always born at the apex of thick, flexible, succulent shoots, and retain accrescent sepals that clasp and surpass the pericarp (Fig. 4a–f). These diagnostic characteristics accord in every way with fruiting structures of the sacred tree (Danthine 1937: Fig. 423–432, 440, 448), yet they contrast remarkably with pomegranate fruits, which normally develop as lateral shoots on thin, rigid, highly ramified, foliaceous stems (Fig. 3b). Hence we are bound to interpret the running palmette-and-fruit motif as a permutation on the lotus bud-and-blossom motif.

PHENOLOGICAL AND MORPHOLOGICAL CHARACTISTICS OF THE EGYPTIAN LOTUS

The convention of presenting three lotus flowers or fruits in the hands of Mesopotamian gods and dignitaries (Fig. 4b, 5d; Danthine 1937, Fig. 488, 524, 818, 909, 913–915, 919) probably derives from the ancient Egyptian practice of portraying lotus blossoms in triplicate (Emboden

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and sacral tree carry a similar crown that is formed by a sun and moon. A similar crown is observed on the sacral tree's guardian serpents in Fig. 1c. Serpentine lotus stems issue from the feet of two personified aquatic divinities. Ft. Shalmaneser, Iraq. 8th c. BCE (Metropolitan Museum New York). **c.** A lotus-goddess stands upon a lotus flower as she raises a pair of flowers to the sun. A solar disk bearing two Egyptian serpents (uraei) symbolizes power and divinity, as do the lions which this goddess has hoisted into the heavens by the hind legs. The masculine equivalent of this floral goddess is seen in Fig. 1b. Ft. Shalmanaser, Iraq. 8th c. BCE (Metropolitan Museum New York). **d.** An Egyptian-styled lotus-goddess emerges inside a winged disk so as to symbolize the immortal sun and flower (compare Fig. 1e). She raises lotus buds from her feathered orb while a priest upholds three of her budding lotus shoots to the 'Queen of Heaven'. Ft. Shalmaneser, Iraq. 8th c. BCE (Metropolitan Museum, New York).

1978, 1989). As noted by Emboden, this custom relates to the natural behavior of lotus flowers, which open and close thrice over the course of three days (Meeuse and Schneider 1979). It is also widely acknowledged that the symbolic relationship between the Egyptian lotus and sun is based on the natural color scheme and radial symmetry of lotus blossoms, for flowers of *Nymphaea nouchalii* display a golden ovarian disk inside a sky-blue corolla (Fig. 1c, 2b, 5c, d, 6b), suggesting the image of a yellow sun in an azure sky. Water lily blossoms also share a close behavioral connection with the sun by the idiosyncratic manner in which they open their petals at dawn and close them before the onset of dusk. Hence Egyptian and Middle Eastern iconographers and mythographers recognized a natural symbolic relationship between their sacred flower and the sun.

The Egyptian lotus also shares a close symbolic association with various mythical serpents known variously as Edjo, Buto, Apep, or Seth. Images of these symbolic creatures appear frequently among reliefs of lotus groves the conventionally encircle Egyptian temples, or otherwise dangle from blue-winged, solar disks that decorate the hallways and portals of temple interiors (Fig. 6c). These standard iconographic forms are apparently based, once again, on the general morphology and natural behavior of lotus shoots, as the latter structures bear a distinct likeness to a snake when they emerge from the dark recesses of their aquatic habitats. Their tubular stalks suggest the image of a rising serpent's body, while their swelling buds suggest the aspect of a serpent's heads (Fig. 3c). Lotus stalks also exhibit a decidedly snake-like behavior following the third day of anthesis, when their peduncles recoil in a serpentine fashion to draw their pollinated flowers back into the water (Fig. 3c; Meeuse and Schneider 1979). Continually rising from, and retreating into, the waters of the rivers and lakes, lotus shoots were envisaged symbolically as the living embodiment of a recurrent sun and serpent: hence the widespread Egyptian and Middle Eastern iconographic custom of associating coiling snakes with budding and flowering lotus stalks (Fig. 1a, 2a, b, c, 4b, 5b; see also Danthine 1937, Fig. 152, 377, 615; Gillispie and Dewachter 1987, Vol. 4: Pl. 29, 41.2, 67.18; Keel and Uehlinger 1998, Fig. 336). To further develop this symbolic relationship, Egyptians often placed the emblem of a sun and moon upon the serpent's head to identify the plant and animal with their sun-like flowers (Fig. 1c, 5c). This same stylistic nuance is frequently encountered in Near Eastern iconography (Fig. 1a, c, d, 5a, b).

The plant's habit of producing a succession of lotus buds, flowers, and fruits is fittingly exemplified, therefore, by the classic bud-and-blossom motif or flower-and-fruit configuration (Fig. 2b, d, 4a, d, f, 5a, 6c, 7b). In fact, all of these plant parts were employed as a symbol of vitality or eternal life. Images of lotus fruits were often carried by kings and aristocrats in the form of ivory scepters throughout the Middle East (Fig. 4c; Avigad 1990; Halpern 1992), for example, on a specimen of which has been traced directly to Solomon's temple in Jerusalem (Avigad 1990; Halpern 1992). This piece gives us reason to believe that kings of his day may have employed the image of a lotus fruit to signify their close relationship with the tree of life.

Egyptian Influences on the Sacral Tree Motif

Art historians have long acknowledged that iconographic schools of art in the Near and Middle East were influenced by the Egyptians (Black and Green 1992:84; Cline 1995; Frankfort 1989; Jones 1986:28–29; Shaw 1992:29), and we frequently encounter the intermingling of Egyptian and Middle Eastern deities and motifs on ancient ivory carvings and metalwork that originate from these regions of the world. We observe, for example, a Near Eastern rendering of the tree of life beside an Egyptian-styled lotus blossom on a silver Phoenician bowl (Fig. 5a). These motifs are presented in a mythical context by associating the lotus-born Egyptian sun-god known as Horus or Harpocrates with a pair of Near Eastern deities, the latter of whom pluck lotus buds and blossoms from the corniculate branches of a sacral tree (Fig. 5a). Similar cross-cultural associations of Egyptian and Near Eastern divinities are observed among a large stash of Phoenician ivories that were unearthed from Assurnasirpal's palaces at Nimrud and Nineveh. One specimen portrays a winged caprid with recurved horns striding across a lotus grove towards a lotus-tree of life (Fig. 5b), his general form and natural surroundings suggesting those of the Egyptian capriform sun-god known as Khnum. Statues of Khnum once lined the main entrance to the temple of Karnak on

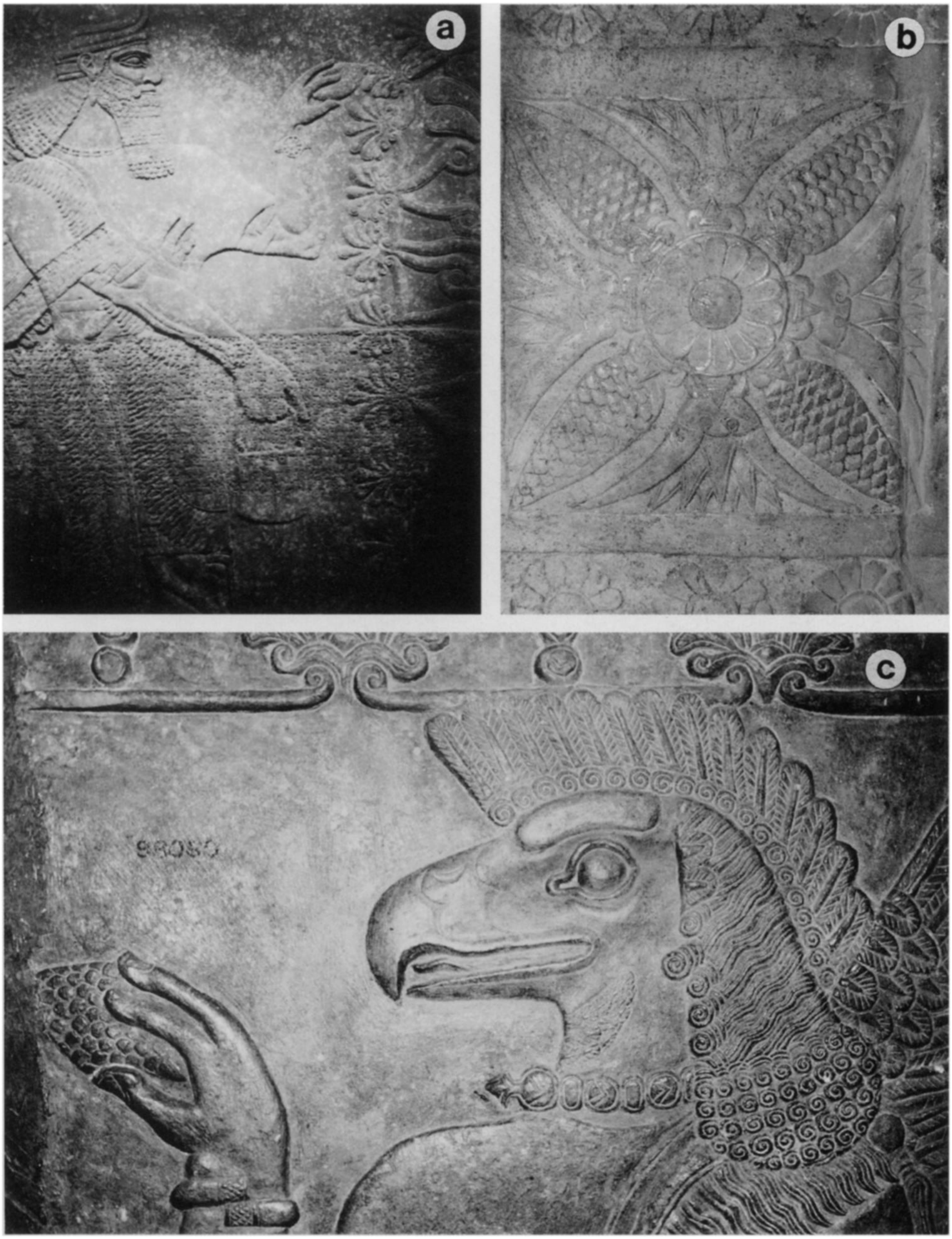

Fig. 6. **a–d.** The anointing cone and Sacred Lotus. **a.** A winged divinity (*lamassu* or *shedu*) holds a pail and touches his cone to a flower on the lotus-tree of life. **b.** He may be extracting immortalizing waters from the plant for the benefit of the king or anointing the plant to insure its resurrection. Nimrud, Iraq. 883-859 BCE (Boston Museum Fine Arts). **c.** The enigmatic cone of griffins and winged genii are often associated with the sacred lotus. Four alternating images of the flowers and cones face the four cardinal point of space, ostensibly to identify the plant as a universal principle. Nineveh, Iraq. 704-681 BCE (British Museum). **d.** A griffin holds a cone before the world-tree. Note that remants of a lotus bud-and-blossom motif run along the upper border (see also Fig. 2b). Nineveh, Iraq. 704–681 BCE (British Museum).

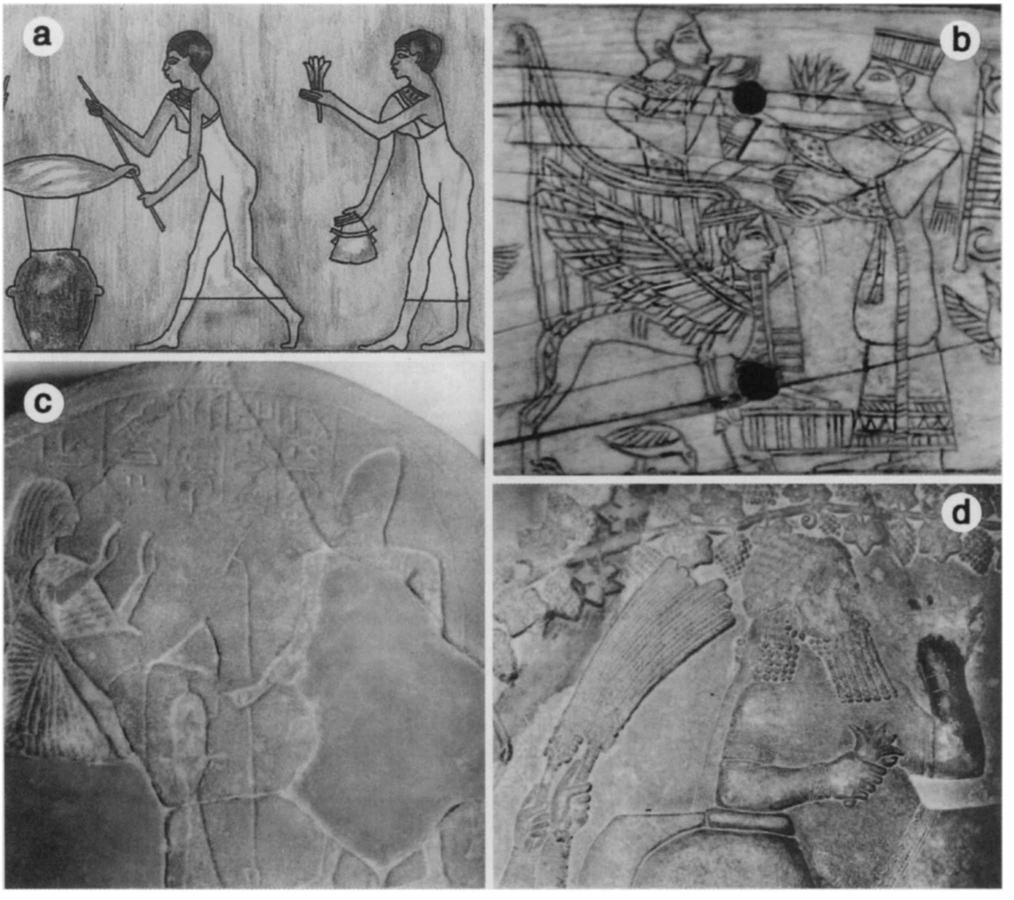

Fig. 7. a–d. The lotus in libation scenes. **a.** Lotus flowers were extracted en masse by the Egyptians. Note that the flower collectors carry the same buckets that are held by Mesopotamian griffins, priests and winged genii. Beni Hasan, Egypt, 2nd millenium BCE (redrawn from Mazar 1961, II:143). **b.** An aristocrat of Canaan is offered a lotus flower and libation cup after returning from a successful military campaign. Note that his seraphic throne is supported by a pair of griffins, whose primary roles are to protect and sanctify the sacred tree of life. Megiddo, Israel. 12th c. BCE (courtesy of the Israel Antiquities Authority). **c.** A lotus libation is offered by a Canaanite priestess to "Seth of Sapuna" (= 'Baal of Sapon'). Note that the god carries an Egyptian 'waz' scepter even though he is a Levantine god. Temple of Baal, Ras Shamra, Syria, 13th BCE (Louvre Museum). **d.** Assurbanipal is offered a libation in a lotiformed cup. He holds a lotus in his hand as he drinks in his garden of delight. Nineveh, Iraq, 6th c. BCE (British Museum).

the Nile (Murnane 1996:288, 306), and also appear among the massive lotus columns that occupy the inner confines of this famous sanctuary. Mesopotamian renderings of this god (i.e., at least in form) pressed deep into the heart of Assyria by the turn of the 1st millennium BCE (Danthine 1937, Fig. 185, 237, 387, 489, 707), and continued to maintain their close associations with lotus groves. Like other Middle Eastern and Egyptian deities, he bears a sun and moon upon his head (Fig. 5b); and we note that the goat's headdress mirrors the general aspect of the sacral tree's canopy, presumably to draw a symbolic connection between the mythical plant and animal.

A Middle Eastern goddess that is frequently encountered among Assurnasirpal's ivory collections (Fig. 5c, d) similarly exhibits the distinctive bodily form and hairstyle of various Egyptian lotus-goddesses (i.e., Maat, Isis, Hathor, and Nut). In one specimen (Fig. 5c) she seems to represent the female personification of a lotus plant, as her stout body seems to take the place of a lotus stalk when she stands upon

a lotus podium to raise her blossoms before an Egyptian-styled sun (Fig. 5c). The goddess grasps two lionesses by the hind legs to signify her feminine prowess and suggest her general equivalency to various masculine gods of the Middle East (Fig. 1b). This goddess of vegetation also identifies herself with the sun (Fig. 5d), in which guise she emulates, once again, various masculine sun-gods in Mesopotamia and Persia (Fig. 1e, 2c; Frankfort 1989, Fig. 428; Rauf 1998:163, 219). Yet she maintains her close association with the sacred lotus by presenting a pair of buds from her radiant body. While she brings life to the proverbial scion of the sun (i.e., lotus shoots), a priest pays reverence by offering her a bouquet of three lotus buds (Fig. 5d).

The Sacral Tree in Religious Ritual

As already mentioned, the tree of life is often protected by various chimeric creatures, including griffins (Fig.1a, b, d), winged humans (Fig. 1e, 5a, 6a), scorpion-men (Frankfort 1939:201, Fig. 33b, c) or fish-men (Black and Green 1992: 83). These hybrid creatures frequently place a cone-like object upon the sacred tree's palmettes or above a king's head (Fig. 1e, 6a, c; Porter 1993). One current interpretation of this recurrent visual theme identifies the cone as the staminate inflorescence of a palm tree, which some commentators believe was held before the tree and king to simulate the act of fertilization through pollination (Black and Green 1992:46; Porter 1993). This explanation is problematic, however, for several reasons, not least of which is the fact that the cone bears no resemblance whatsoever to a spathate, highly ramified, date palm inflorescence (Fig. 3a). Nor do we ever encounter images of date fruits or palm infructescences in these scenes. That the cone appears at the apex of lateral branches also discounts the notion that the cone represents a plant's flowering stalk (Fig. 1b; Danthine 1937, Fig. 380, 407, 409–412), since flowering shoots of a date palm invariably dangle below the tree's canopy (Fig. 3a; Danthine 1937, Fig. 409–412, 580).

An alternative interpretation of the cone ritual suggests that the king is being atoned or equated with the tree of life (Frankfort 1989:160; Parpola 1995). Whether this is the case or not, we may be sure that the cone relates in some way to the lotus plant, since the structure is frequently associated with lotus stems and flowers on seals and temple reliefs (Fig. 6b, c; see also Danthine 1937, Fig. 380, 407–412, 490; Frankfort 1989: 197; Jones 1986, Pl. XII.1,4,14; Menant 1887, Pl. VIII.3). One might hypothesize that the cone represents a stylized bud or fruiting shoot of a lotus plant, but neither of these interpretations is entirely satisfying, since imbricate petals of a water lily are never exposed outside of the four tightly clasping sepals, and *Nymphaea* fruits are always ovoid (Fig. 2b, d, 6b, 7b). Whatever the underlying significance of this puzzling structure, the cone is often displayed as a recurring element in a metamorphosing vegetative structure, and probably relates to the concept of eternal recurrence.

The enigmatic cones and buckets that are customarily employed by winged genii in some sort of ritualistic context apparently relate to the giving or taking of life from the sacral tree (Fig. 1d, e, 6a). On the Nile River at Beni Hasan we observe the same distinctive bucket in the hands of Egyptian maidens, who employ the implement to harvest lotus flowers and express their juices into large urns (Fig. 7a; Mazar, 1961 II: 123, III:85, V:85). While archeologists usually suggest that this scene portrays the preparation of perfumes (Lucas 1948:106; Mazar et al. III: 85), there is now reason to believe that the plants were used for different purposes. Recent reports indicate that *Nymphaea* species produce opiate alkaloids (Diaz 1975) and that these psychotropic constituents have been employed by various peoples in ancient Egypt, India and Mexico to induce visions and euphoric states of mind (Emboden 1978, 1979, 1981, 1989; Nunn 1996:157; Spess 2000). Emboden (1978, 1979, 1981) suggests that water lily extracts were employed by Egyptian healers as a shamanistic medium, perhaps in concoctions of poppy and mandrake potions, based on recurrent associations of lotus flowers with drinking vessels in libation scenes. Emboden (1979) references various pharmacological studies that identify the narcotic properties and constituents of water lilies (Delphaut and Balansarad 1941; Descourtilz 1829:266; Pobeguin 1912:49), and confirms these reports by personal experimentations with macerated preparations of Egyptian lotus buds and flowers. He reports that he experienced narcosis, altered visual perceptions, and auditory hallucinations. Diaz (1975) later confirmed that Mexican water lilies produce isoquinoline alkaloids, and hypothesized that these substances are responsible

for the frequent occurrence of water lilies in mythic and ritualistic scenes on Mayan temples (Dobkin de Rios 1974; Diaz 1977; Emboden 1979, 1983; Rands 1953). More recently Spess (2000) has identified the western and eastern lotus (i.e., *Nymphaea* and *Nelumbo,* respectively) as psychotropic plants, suggesting that both plants have played a crucial role in the shamanistic practices of ancient Egypt and Asia.

Evidence for the use of lotus extractions in religious ceremonies extends far beyond the banks of the Nile, as we frequently encounter images of the Egyptian lotus in depictions of libations scenes in Mesopotamia, Israel, Lebanon, and Syria (Mazar 1961, I:121, II:45, 143, 270, III.102, IV:96, 140). A famous relief on the palace walls of Assurbanipal (a 6th c. BCE) portrays, for example, an eventual heir to Assurnasipal's kingdom with a lotus blossom in one hand and a damaged drinking vessel in the other (Fig. 7d). The sovereign's consort is positioned at the foot of his couch with a petaloid cup in her hand (Frankfort 1989, Fig. 217), suggesting that she drinks directly from a lotus blossom. This image compares closely with a libation scene portrayed on an ivory plaque from Megiddo, Israel, that dates from the 12th century BCE. Here we observe the presentation of a libation cup and lotus blossom to a Canaanite aristocrat (Fig. 7b). The peculiar chair on which this king sits is of notable importance, in that it matches with biblical descriptions of King Solomon's 'mercy seat', the sacred throne upon which the famous anointed kings of Yahweh's people sat when they consorted with the ark of the covenant in the holy of holies (*Exodus* IXX: 19–22; *Samuel* IV.6, VI.2; 1 *Kings* XXVII.25; *Hebrews* IX:5). Indeed, images of the original builder of Solomon's temple in Jerusalem, Hiram of Tyre (1Kings V), occupies the same seraphic throne on his sarcophagus (Mazar 1961, II:143). And drinks from the same libation cup while holding a lotus in hand, while being surrounded by a running lotus bud-and-blossom motif. All of the aforementioned scenes bear close relation to an older relief (13th c. BCE) at Ras Shamra, Syria, in which a priestess stands before a lotus and libation vase as she pays reverence to the father of the Ugaritic pantheon, Seth of Sapon (i.e., Baal; Fig. 7c). Although this scene employs Egyptian imagery and is inscribed in hieroglyphs, the god to whom the stele is dedicated is decidedly Levantine.

The Sacral Tree in Middle Eastern Myth

Although many scholars have attempted to interpret the symbolic meaning of the sacral tree in the visual arts, seldom are efforts made to connect these visual motifs with mythical allusions to an immortalizing plant (Roaf 1998:226). Parpola (1993:165) asserts that the sacral tree of Middle Eastern iconographic traditions bears no direct relation to mystical trees in cuneiform texts, but he bases this conjecture on the erroneous assumption that the plant in question is a date palm. But if we consider that the sacral 'tree' is more accurately conceived as a stout aquatic herb with blue blossoms and a golden ovarian disk, we find ample reason to believe that pictorial representations of the world-tree reflect various mythical themes of the Middle East. Sumerian texts from the mouth of the Tigris River describe, for example, a primordial tree of creation that arose from the generative waters of Ur (i.e., near Eridu, Uruk and Eden) with "leaves" the color of lapis lazuli (Jacobsen 1970:1; James 1966:13; Langdon 1928). This plant is called the *giz-kin* in Sumerian tablets or the *kiskannu* in Akkadian texts (Langdon 1928). We presently know of no aquatic plants that produce blue foliage, nor do these characteristics apply to riparian palms or pines (James 1966: 13). Yet the blue leaves of this primeval plant may conceivably pertain to the Egyptian lotus, if we interpret the leaves of the *kiskannu* as the blue, foliose petals of a water lily.

The *giz-kin* or *kisannu* plant is closely associated with a riverine deity known as Enki, a Mesopotamian god of wisdom who once plied the banks of the Tigris River on a 'boat of lapis lazuli'. This god of sweet waters also shares close mythical associations with a popular sun-god (Marduk or Shamash), the latter of whom is occasionally identified as the offspring of the river god. Hence the close relation of these three mythical players—water god, sun god and primordial plant—seems to bear a direct relation to the iconographic confluence of these same symbolic images (Fig. 1a, c, d, 2c, 5a, b, c). The Babylonians referred to Enki by the name of Ea, and symbolized this god of waters with the image of a pillared ram's head (Black and Green 1992, p. 16). This motif relates, no doubt, to the god's mythic identification with an aquatic dragon and ibex in the 'watery deep' (*abzu*) of Eridu

(Kramer and Maier 1989:39, 43), and likely bears some relation to the aforementioned image of an aquatic ram that approaches a pillared lotus-tree with serpentine stems (Fig. 5b; see also Frankfort 1989, Fig. 152, 225, 287, 296, 379, 393; Keel and Uehlinger 1998, Fig. 52, 53, 219, 223).

According to another ancient Sumerian myth, the primordial tree of creation, or *huluppu* plant, was first plucked from the waters of the Euphrates River by a close female associate of Enki, namely Inana, Sumeria's most famous goddess of vegetation (Wolkstein and Kramer 1983:4–9). This goddess cultivated her riverine plant in a holy garden so that it might eventually provide her with a throne and a bed. Unfortunately for the Inana, her precious plant was soon inhabited by a serpent in its roots and an *anzu*-bird in its boughs (much as other immortalizing trees of the ancient Orient). Since these symbolic creatures of the Earth and Sky (respectively) proved unwilling to share the use of their home with the gods, Inana was forced to enlist the help of her famous mythic brother, Gilgamesh, to dispossess the serpent and bird of their home. Having accomplished this feat, Inana fashioned a diadem for her brother and a bed for herself out of the roots and trunk of the wondrous plant.

The Sumerians normally recognized Inana as a goddess of the skies and a sister of the sun-god, Utu. Yet she frequently pays a visit to the underworld of her sister, Ereshkigal, in the aquatic domains of Uruk and Eridu (i.e., near Ur and Eden of Sumerian myths; Wolkstein and Kramer 1983:51–91). In this respect her physical attributes and mythic activities seem to mirror the morphic and behavioral characteristics of her cherished plant; for Inana is intimately associated with aquatic environments, a primeval tree of creation, the cyclic occurrence of vegetative life, and ornaments of gold and lapis lazuli (i.e., the natural colors of the Egyptian lotus). She displays her adornments in the heavens and discards them from her body when she descends into the bowels of the Earth (presumably on an annual basis), much as a lotus blossom. Inana was occasionally identified as none other than Ishtar of Babylon and Assyria or as Ashtarte, Ashtoreth, Asherah or Anat of Canaan and Egypt, all of whom share close iconographic relations with the sacred lotus (Fig. 4 c, d; Budge 1969:278–280; Frankfort 1939:207, 278; Keel and Uehlinger 1998:54, 65, 66, 86, 87, 360; Patai 1990:58–60, Fig. 12–16, 18).

The *huluppu* plant of Inana is possibly the same immortalizing plant that eluded her famous heroic brother, Gilgamesh, whom in the mythical guise of a mortal man sought a sweet-smelling, aquatic flowering plant (Pritchard 1969:73). Various versions of the Gilgamesh story are recorded on tablets of the Akkadians, Sumerians, Hittites, Hurrians, and Assyrians, and all recount the manner in which a crafty serpent succeeds in reclaiming the plant of the gods from this heroic figure before he is able to consume his prized possession (Pritchard 1969:96). As the serpent repossesses his rightful property, he slips out of his worn-out skin to reveal his immortal character to Gilgamesh, thereby signaling that humankind will be denied the gift of eternal life. It is widely acknowledged that this tale shares a common origin with the biblical account of Eden's proverbial tree of life, since both tales incorporate the mythical themes of a sacred tree, devious serpent, human aspirations to live in paradise, and the origin or perpetuation of human mortality. And it is similarly hypothesized that these tales share close relations with the 'Myth of Etana', in which tale a heroic shepherd known as Etana is granted access to a 'tree of rebirth' (the *sammu* plant) by following the helpful advice of a sun-god (Shamash). In this case, the shepherd is able to elude a diabolical serpent at the root of the sacred tree by mounting the back of a divine eagle to reach the upper boughs of the plant (Black and Green 1992:78; Pritchard 1969:114–119). These and yet other related mythical tales probably relate to the iconographic practice of placing a winged solar orb, eagle, or leogryph above or beside the tree of life (Fig. 1a, c, d, e, 2c), and the custom of placing sacred serpents around the tree's solar orb (Fig. 1c, 5c) and pillared trunk (Danthine 1937, Fig. 152; Frankfort 1939:120–122).

THE RETURN OF THE TREE OF LIFE

Various mythic traditions of Europe and Asia maintain that the tree of life will reappear on Earth at some time in the distant future and bestow eternal life upon living creation. Zoroastrians believe that the 'tree of all seeds' (*homa*) will spring from the waters of Lake Hamun of Iran during the Earth's final days of reckoning (*Bundahisn* xxvii.4, xxx.24–25; see West 1880, SBE 5:126; Boyce 1991:125), while Muslims

await a similar plant in paradise on the last day of judgement, when it will take its predestined place at the right hand of Allah in the seventh level of heaven (*Koran* liii, lvi). Rabbinical literature acknowledges that the tree of immortal life resides permanently in Yahweh's garden of paradise (*Jalkut Shimeon, Genesis* xx; James 1966:778), whereas Christians anticipate the reappearance of the same plant in Jerusalem upon the return of Jesus Christ (*Revelations* ii, xxii). While these and related beliefs have long been dismissed as superstitious speculations by biologists, there appears to be an underlying historical significance to these mythic and prophetic scenarios. An objective consideration of the archeological record suggests that the plant in question is the Egyptian lotus, and that humankind has never lost contact with the famous 'plant of the gods'. What has apparently been lost over the ages is our understanding of the mythic significance of the plant, and the ritualistic role it once played in the religious traditions of our distant forebears.

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TREES, SNAKES AND GODS IN ANCIENT SYRIA AND ANATOLIA[1]

By W. G. Lambert

For too long study of ancient Near Eastern representational art and study of possibly related texts have been entirely separate disciplines, the one a branch of archaeology, the other of philology. This accounts for the very scanty results obtained and their frequently questionable character. In the case of Classical Greece and Rome art historians ordinarily command Greek and Latin so as to use written sources at first hand, but Near Eastern archaeologists have commonly been illiterate in their fields of study, while philologists often have limited knowledge of art and use that very amateurishly. Thus it is an occasion for rejoicing that a serious attempt has just been made on some very difficult material from Syria and Anatolia, and that one major break-through has resulted which opens up prospects of fuller understanding of certain aspects of ancient art. The author, E. Williams-Forte, is primarily an art historian with a speciality in ancient Near Eastern seals, and she has taken an interest in Ugaritic to be able to exploit that material. Her Columbia Ph.D. thesis: *Mythic cycles: the iconography of the gods of water and weather in Syria and Anatolia during the Middle Bronze Age (ca. 2000–1600 B.C.)* has not been published, but a lengthy article derived from parts of it has recently appeared.[2] This starts from the tree and snake in the garden of Eden and investigates their possible Canaanite background. The original observation of major importance is that the storm god of Syria and Anatolia of the first half of the second millennium B.C., Anatolian Tarḫunna, Syrian Hadad or Baal, Mesopotamian Adad, occasionally holds up a plant, branch or tree as a symbol.[3] This is entirely explicable from his sending down rain to the earth by which plants are nourished. More commonly, as is well known, he holds forked lightning, a symbol of the rain-bringing storm, and with this symbol he is common in contemporary Mesopotamian art also. The storm god is well known to have been one of the highest gods in the pantheons of northern Mesopotamia, Syria, Palestine and Anatolia, and this plant or tree can now be seen as a forerunner of the stylized tree ubiquitous in Mitanni art, which is found from Western Iran to the Mediterranean during the third quarter of the second millennium. There is good reason to consider it a divine symbol rather than an item of decoration alone because on seals it is so commonly held by one or two figures. On faience seals these figures are generally either nude and kneeling, or clothed and either standing or sitting. The nude figures in fact wear a double-stranded belt which is visible in clear examples, and this shows that they are derived historically from the

[1] See p. 612 below. The writer thanks O. R. Gurney, D. Collon and J. E. Reade for comments and suggestions. However, it must not be assumed that they necessarily agree with everything contained in this article.

[2] E. Williams-Forte, ' The snake and the tree in the iconography and texts of Syria during the Bronze Age ', in L. Gorelick and E. Williams-Forte (ed.), *Ancient seals and the Bible* (see the review below, p. 612), 18–43.

[3] See Williams-Forte's figs. 4–11 and 13–15, to which add: N. Özgüç, *The Anatolian Group of cylinder seal impressions from Kultepe* (cited henceforth ' Özgüç '), no. 7 and C.F.-A. Schaeffer-Forrer, *Corpus des cylindres-sceaux de Ras Shamra-Ugarit et d'Enkomi-Alasia*, I, 62, Chypre A9. Note also the tree abutting Baal's shoulder in B. Parker, *Iraq*, 11, 1949, pl. ii, no. 8. Though we often call this symbol a tree, we do not thereby commit ourselves to its being a tree rather than a branch or plant.

Old Akkadian hero with six curls, the *laḫmu*, a type of minor god.[4] Of the clothed figures, a single one could represent the storm god himself, but a pair would have to be either minor gods or priests.[5] On stone seals with their greater detail the storm god is usually identified without difficulty throughout these areas. In Anatolia the earliest evidence comes from a group of seal impressions on cuneiform tablets of the Assyrian merchants. While using a large quantity of motifs of Mesopotamian origin, they exploit it in a context of Anatolian religions. Thus the gods are shown clothed as Mesopotamian gods, though very off-beat in detail, but the storm god is easily identified from the bull he rides or holds back with reins, the forked lightning or ' tree ' he holds as an identifying symbol, and a raised weapon he often brandishes.[6] In Syria in addition to the forked lightning or ' tree ', bull and raised weapon, he has a characteristic dress: short kilt and spiked helmet, with long plait down the back.[7] This Syrian style Hadad is also known from second-millennium Hittite art, but with tall, often horned, headdress instead of spiked helmet.

The various marks identifying the storm god have been known for long and there is no question about him in this respect, but the symbolism still needs study. Thus according to Williams-Forte use of the bull is partly due to ' that fertile animal's role as the means of propagation and thus perpetuation of the herds ' (p. 24).[8] This view arises from the modern term ' fertility ', beloved of historians of religion but not so easily found in the ancient texts. In Akkadian, the best documented language of the ancient Near East, the obvious words which spring to mind in this connexion are *nuḫšu*, *ṭuḫdu* and *ḫegallu*, which refer to abundance of water and profusion of plant life, and are often found in association with Adad, but are not used for fecundity of domestic animals. The root *dš'* covers all kinds of profusion, animal, vegetable or liquid, though even this does not quite equal the modern ' fertility ' in lacking any sexual overtones. In Akkadian literature there is common allusion to Adad's sending rain, but the present writer has not seen any passage which refers to Adad's responsibility for impregnating herds of cows. The Babylonians were of course very familiar with animal husbandry, and worshipped gods who were concerned with this, namely Amurru and Šakkan, so the lack of this attribute from Adad is significant. Syrian and Anatolian religions may have been different in this matter, but until some specific evidence is forthcoming caution must be maintained. In Akkadian texts Adad is a bull because his roaring was the thunder that brought rain.[9]

With the appearing of Mitanni art in the middle of the second millennium and the consequent gradual disappearance of Syrian art, the very distinctive Syrian Hadad likewise generally disappears. The god himself lost nothing in importance under the Mitanni empire, so art should be scanned for signs of him.

[4] For the Mitanni type see e.g. Briggs Buchanan, *Catalogue of ancient Near Eastern seals in the Ashmolean Museum*, I, Cylinder seals, nos. 926–33. On the Laḫmu, see the fundamental article of F. A. M. Wiggermann, ' Exit Talim ! ' (*JEOL*, 27, 1983, 90–105). Already in the Akkad period these minor gods hold up symbols while kneeling, see e.g. G. A. Eisen, *OIP*, 47, no. 35. See further the writer, ' The pair Laḫmu-Laḫamu in cosmology ', *Or.*, 54, 1985, 189 ff.

[5] Single seated figure: e.g. C. F.-A. Schaeffer-Forrer, op. cit., 139, R.S. 24.155; two standing figures: e.g. op. cit., 123, R.S. 21.16.

[6] See Özgüç *passim.*

[7] See A. Vanel, *L'Iconographie du dieu de l'orage*, ch. v.

[8] The Baal myth passage from Ras Shamra (*KTU*, 1.5 v 18 ff.), in which Baal impregnates a cow 88 times, has been alleged as evidence of his fertility, but when only a single offspring resulted it would be more logical to argue the opposite: that Baal is shown to be singularly lacking in fertility ! On a more serious level the passage is irrelevant, and a further evidence of the confusion brought about by the misuse of the term ' fertility '.

[9] Adad is ' the bull of the skies ' (*šu-ur ša-ma-a-i*: *CT*, 15 4 3) and his voice is thunder, see *rigim Adad* in the Akkadian lexica.

Forked lightning, save for rare examples,[10] is no longer used. Also seals, the main surviving body of material, do not usually show gods mounted on symbolic animals. Thus the ubiquitous stylized tree,[11] as already noted, must be the symbol of Teshub in Mitanni art, and when, for example, a single standing figure in divine garb and with the horned tiara of divinity is shown holding it, presumably that is Teshub himself.[12]

There is little evidence from Syria and Anatolia for the last two centuries of the second millennium, but in Babylonia under the second Isin dynasty (*c.* 1156–1024 B.C.), the only common seal type shows a distinctive stylized tree and a prancing animal, most commonly a bull. The Babylonian seals commonly have rows of triangles along the upper and lower borders, imitating gold caps with triangular patches of granulation.[13] There is a south-west Iranian equivalent of this type of seal, but lacking the borders of triangles.[14] The high stylization of the tree and heraldic pose of the animals certainly suggest a symbolic content, and the god Adad is the only obvious and likely referent. He was less popular in southern Mesopotamia than in northern Mesopotamia, Syria and Anatolia, because farming in the south does not depend on rain. Attempts to maintain his northern status were made by giving him control of subterranean water (properly Ea's domain),[15] and the personal names ' Adad is king/lord of the gods ' appear in both the Old Babylonian and Cassite periods.[16] So far as is known, there was no special attachment to him under the second Isin dynasty, indeed that was the period when Marduk officially became head of the pantheon.[17] However, Nebuchadnezzar I does pray to Adad of Babylon and ascribes his victories to him in a bilingual text on a stone tablet.[18] One could have expected him to ascribe victories to Marduk, the newly proclaimed head of the pantheon, but perhaps in Nebuchadnezzar's view Adad was a form of Marduk. Enūma Eliš gives Adad as Marduk's 47th name (VII 119–22), with emphasis on rain-giving. Adad's temple in Babylon, Enamḫe, could have been understood as a subordinate shrine of Marduk. Thus it is entirely possible that this second Isin dynasty tree was a symbol of the storm god.

[10] E. Porada, *Corpus of ancient Near Eastern Seals in North American collections : the collection of the Pierpont Morgan Library* (henceforth : *CANES*), no. 1020.

[11] H. Danthine, *Le Palmier-Dattier et les arbres sacrés dans l'iconographie de l'Asie occidentale ancienne* (1937) contains a lot of material and a summary of opinions, but mixes up too many entirely diverse things to have any serious value as original interpretation. The more recent work of C. Kepinski, *L'Arbre stylisé en Asie occidentale au 2ᵉ millénaire avant J.-C.* (1982) is restricted to one millennium, but the concentration on form and exclusion of function and meaning again results in unrelated items being thrown together. The Middle Assyrian tree with the bent trunk, however stylized in depiction, is usually meant as a real tree in a landscape. The common Mitanni stylized tree is a symbol not meant as a real tree in a landscape. The purpose of this book would have been clearer had the title read : *Les Arbres stylisés* . . . . H. York, ' Heiliger Baum ' in *Reallexikon der Assyriologie*, IV, 269–82, offers a useful survey of the material with bibliography, but does not take up seriously problems of significance.

[12] e.g. E. Porada, *AASOR*, 24, nos. 98–9 ; O. Weber, *Altorientalische Siegelbilder*, 473.

[13] See pro tem. the author, *Syria* 58, 1981, 175[1].

[14] P. Amiet, *Glyptique susienne*, nos. 2121–4.

[15] cf. *bēl nag-bi ù zu-un-ni* ' lord of abyss and rain ' (*BBSt*, no. 6 ii 41). H. J. Deighton, *The ' Weather-God ' in Hittite Anatolia* (BAR International Series, 143), develops the thesis that the Anatolian storm god controlled springs and fountains and was not in reality a storm god. Some evidence in favour of this view is presented, but since in the Hittite-Hattian myth ' The Moon that fell from Heaven ' ^{d}U is concerned with thunder, rain and wind, a balanced view must accept both aspects. The term ' weather-god ' should certainly be abandoned as mistranslation by assonance of the German *Wettergott*. Sunshine is as much weather as rain !

[16] For Old Babylonian examples see W. Sommerfeld, *Der Aufstieg Marduks*, 72 f. ; for later examples see the writer, *BSOAS*, XLVII, 1, 1984, 3.

[17] See W. Sommerfeld, op. cit., and the review article cited in the last footnote.

[18] *BiOr*, 7, 1950, 42 ff.

The better-known first millennium sacred tree is altogether more obscure. It occurs very frequently in the palace reliefs of Ashurnaṣirpal II at Nimrud,[19] and in such profusion and position that it can hardly be a symbol of Adad. Only Ashur or perhaps Ninurta could be considered. Commonly there is a standing genie each side holding up to it fir cone (?) and bucket.[20] We take the view that these creatures function as pollinators, and that the tree was considered a palm.[21] Palm trees needed artificial pollination to give the best yield. These pollinators also appear in the same reliefs either side of the king (always with bucket, variously with or without cones) and flanking entrances (with or without cones as for the king). Thus the cones (?) were considered essential for the tree, but not for the king or at entrances. Clearly the action of the genies should not be pressed in its natural sense. Palms may need pollination, but not the king or his visitors. We suggest that the fertility of palms was understood in a figurative sense of prosperity and success. Such a concept is well known in late second- and first-millennium Babylonia and Assyria. Figurines buried at entrances are inscribed: 'Uproot disease, enter, Mešrû',[22] a term translated 'wealth, prosperity, riches' by the *CAD*, also used as a poetic name of the palm tree. Thus it is argued that this stylized tree did not, in Ashurnaṣirpal's palace, symbolize any particular deity, but was similar to the Roman's *bona Fortuna*.

First-millennium cylinder seals support this interpretation. A few show the tree being pollinated, as in the Assyrian palace reliefs.[23] But the vast majority show the tree immediately under the winged solar disc. Occasionally there is a bust in the disc, less frequently two minor busts in addition, one to either side.[24] The juxtaposition of tree beneath disc already occurs in Mitanni art, but there the squeezing of the maximum number of items in the available space and the overwhelming desire for symmetry and artistic effect allow the possibility of interpreting the two items separately.[25] In any case the juxtaposing is not

[19] J. B. Stearns, *AfO*, Beiheft 15, pls. 85–91. See also J. Meuszyński, *Die Rekonstruction der Reliefdarstellungen*, pls. 1–17.

[20] The kneeling genies in contrast cosset the trees with their bare hands. Since this action does not appear elsewhere, e.g. in glyptic, it may be a secondary, local variation.

[21] One may ask whether the Mitanni seal rolled on a fourteenth-century Middle Assyrian tablet from Assur (O. Weber, *Altorientalische Siegelbilder*, no. 470 = A. Moortgat, *ZA*, 47, 1942, 85, Abb. 76) does not anticipate the first millennium pollination. A typical 'elaborate style' stylized tree has two bunches of dates added, and to its right stands a figure with a kind of bucket in one hand and a piece of vegetation in the other. This latter appears elsewhere without any associated date palm (e.g. Briggs Buchanan, *Early Near Eastern seals in the Yale Babylonian Collection*, no. 1276), but nevertheless, it can be argued that in the Mitanni seal pollination is meant, and the dates were added to make clear that the tree was understood as a date palm.

[22] *KAR*, 298 rev. 9–10 = O. R. Gurney, *AAA*, 22, 1935, 70–71.

[23] e.g. *CANES*, 770; *Iraq*, 41, pl. ix 78; O. White Muscarella (ed.), *Ladders to Heaven*, no. 104; U. Moortgat-Correns, *Münchner Jahrbuch der bildenden Kunst*, 3. Folge, 6 22 no. 38; *PBS*, XIV, no. 598; L. Delaporte, *Musée du Louvre, Catalogue des cylindres*, II, A 723; M. de Clercq and J. Menant, *Collection de Clercq, Catalogue méthodique et raisonné*, I, 341–3, 346: all most likely Babylonian rather than Assyrian.

[24] W. G. Lambert, *Iraq*, 41, 1979, 35–6.

[25] Though the winged solar disc in Near Eastern art is of Egyptian origin, its placing above a stylized tree is not, so the origin of the combined motif has to be sought in Asia. We suggest that the origin is to be found in standards on poles. The so-called gate-post is often held as a symbol in Akkadian glyptic: a pole with extras at the top (e.g. R. M. Boehmer, *Die Entwicklung*, Abb. 499–502, 518, 520, 522–524, etc.). Rarely in Akkadian and Ur III glyptic other symbols appear on top of poles (op. cit., Abb. 158; Briggs Buchanan, op. cit., 601–2), but in Old Babylonian seals the symbol on a pole ('standard') is much more common (*CANES*, 296, 297, 325, 351, 354, 358, 366, 384, 388, 414, 435, 451, 458, etc.). Of these Old Babylonian standards, that with a lionhead either side of a central macehead (op. cit., 351, etc.) often rests on a pole whose representation is decorated with diagonal hatching. In Syria the urge for greater decorative effect resulted in fancier poles to support symbols, among which the winged solar disc appears (e.g. op. cit., 955, 957). At times these Syrian supports could best be termed columns, and some are so fancy as to suggest trees (e.g. O. White Muscarella (ed.), op. cit., no. 214; Briggs Buchanan, op. cit., no. 1271;

particularly common, and worshippers are not adoring this combination of motifs.[26] In the first-millennium seals the winged disc and tree are clearly one combined symbol. Ropes often hang from the disc, which worshippers, one either side, grip. Thus the disc is not, as in presentation scenes, an extra item unrelated to the main scene. The disc is well known to represent a god, the sun god Šamaš at first, but later in Assyria it is apparently used for the national god Aššur.[27] The sun god continued to be a popular god throughout the first millennium, but the popularity of the disc is such that one may wonder whether in Babylonia it did not represent Marduk (called ' the sun god of the gods ' by Babylonian theologians).[28] The first two groups of seals are the Neo-Assyrian linear style (*CANES*, 640–47, etc.) and the Neo-Babylonian early cut style (op. cit., 726–31, etc.),[29] both *c.* 900–800 B.C. In both styles there is characteristically a figure either side. The Assyrian figures hold the ropes from the disc, the Babylonian figures normally kneel with hands outstretched in the attitude of adoration normal for this period. Thus it would appear that the disc is being worshipped and that the tree is a supporting property, a sign of the blessings which flow from the deity above. Later modelled style scenes, both Assyrian and Babylonian so far as can be ascertained (op. cit., 771–5, etc.), may show the busts in the winged disc and may have two bull men supporting it, worshippers and pollinators. The stylized tree can be replaced by a realistic palm, though this is rare (op. cit., 774, etc.). It might be argued that two deities are represented : the sun above and the storm god below. Šamaš and Adad were worshipped together as the givers of oracles, but only in the second millennium, Šamaš alone was the giver of oracles in the first millennium.[30] Also, when worship of two deities together, in anthropomorphic form, is seen on first-millennium seals, it is regularly one male and one female, so spouses.[31] There is thus no good reason to take the first-millennium stylized tree in Mesopotamia as a symbol of a particular god. It seems rather to symbolize the blessings which

L. Delaporte, *Catalogue des cylindres . . . de la Bibliothèque Nationale* (henceforth : *BN*), nos. 466–7), and in other cases can only be described as stylized trees (e.g., loc. cit., 435). Thus when one finds a more or less naturalistic palm tree under a winged solar disc (Muscarella, op. cit., 215), the pattern is derived from a symbol on a pole, but the motif has been expanded into a real tree with superimposed disc. Note that a presumably Old Babylonian terracotta (M.-T. Barrelet, *Figurines et reliefs en terre cuite de la Mésopotamie antique*, I, no. 815) shows a solar disc (without wings) mounted on the trunk of a palm tree.

[26] Note from Nuzi : E. Porada, *AASOR*, 24, no. 92 ; from Assur : T. Beran, *ZA*, 52, 1957, 144, Abb. 3 and 189, Abb. 84 ; *BN*, 468. There is no certainty in this last example that the figures either side of the tree and winged disc are worshipping them. By the direction of their faces they seem to be showing respect to each other.

[27] In groups of symbols in Late Assyrian royal sculptures it certainly represents Šamaš, from Ashurnaṣirpal II see e.g. *Propyläen Kunstgeschichte*, XIV, pl. 197, but when in the same king's reliefs the winged disc with bust appears (never in a group of symbols), e.g., op. cit., pls. 198 and 203a, it is hard to see it as other than a symbol of Aššur. In the last case it is placed above the head of the advancing king, and the bust, like the king, is shooting an arrow. Though the king's inscriptions refer to his conquering ' with the help of Šamaš and Adad ' (e.g. *AKA*, 179 18), other passages name Aššur alone : ' with the help of Aššur, his lord ' (e.g. op. cit., 177 4).

[28] e.g. Enūma Eliš, I 102. Also two late compilations explain Šamaš as a name of Marduk : ' Šamaš is Marduk of justice ' (*CT*, 24 50, BM 47406 obv. 9) and ' Šamaš is Marduk of the law suit ' (*AfO*, 19 115, C 5, comm.).

[29] While every one is agreed that these are Babylonian, there appears to be no direct evidence supporting this conclusion, and it appears that none of this type have been excavated at Babylon Ur or Uruk.

[30] The earlier *tamītu* texts, addressed to Šamaš and Adad, are represented in late Assyrian times by similar texts addressed to Šamaš alone. They are published by J. A. Knudtzon, *Assyrische Gebete an den Sonnengott*, and E. G. Klauber, *Politisch-Religiöse Texte aus der Sargonidenzeit*. A new edition is in preparation by I. Starr.

[31] These are mostly in the early Neo-Assyrian drilled style : *CANES*, 691, 693–5 ; *BN*, 354, 355, 357 ; etc.

flow from worship of a particular deity. The rarity with which the tree alone receives human adoration confirms this point.[32]

Though the precise shapes of the Middle Babylonian, Neo-Babylonian and Neo-Assyrian trees are inadequate in themselves to prove influence from the Mitanni tree, which itself has two particular characteristic forms: a simpler on faience and a more complex on stone, the period at which the tree becomes popular in Mesopotamian art, and the lack of allusions to this tree in Babylonian and Assyrian religious texts or texts with information on religious matters, strongly support the idea that the motif was borrowed from the culture of Northern Mesopotamia, Syria and Anatolia where it was a symbol of the storm god.[33]

Against this background, where does the tree of life in Genesis fit, if it does? Two trees are in fact specified in the garden of Eden: the tree of life, and the tree of knowledge of good and evil. There is a well-known awkwardness about the mention of sometimes one, sometimes the other, and many scholars consider the latter original, and the tree of life an editorial expansion. But the former is in fact in the only surviving text, and must be considered. The meaning of tree ' of life ' is made clear in Genesis 3 : 22 : its fruit would confer eternal life on the eater. This is entirely distinct from any other function of a sacred tree in the ancient Near East.[34] A development could be imagined from fertility of plants to fertility of animals and man, and so to long life and immortality, but the Biblical context offers otherwise only the tree of knowledge of good and evil, which is unrelated to any simple or stretched notion of fertility. Also, it must be observed that any ancient Near Eastern garden could be expected to have some trees in it, quite apart from antecedent religious symbolism. Thus there is little encouragement to imagine hypothetical bridges between profusion of plant life and human immortality, unless some new evidence attesting them comes to light.

Baal and a snake are attested more explicitly in both glyptic and literature. Both Anatolian-style seals from Kultepe impressions (*c.* 1900–1750 B.C.) and Syrian seals (*c.* 1900–1600 B.C.) show Baal or a cognate deity spearing, having subdued or killed, and associated with a fully naturalistic snake. Williams-Forte has collected more examples than previously noted and has offered precise interpretations of them. Her work in this branch of ancient art was known previously from a Metropolitan Museum of Art catalogue, *Ancient Near Eastern seals: a selection of stamp and cylinder seals from the collection of Mrs. William H. Moore* (1976) and from the partial catalogue of the Borowski collection: O. White Muscarella (ed.), *Ladders to Heaven* (1981). She has done some excellent work in advancing understanding of the meaning of the ancient seal designs, but it seems to us that occasionally she over-interprets the evidence. The question always is how far the various items shown on a single seal are related to each

[32] Only *BN*, 383; de Clercq, I, 343 and 346; and U. Moortgat-Correns, *Münchner Jahrbuch der bildenden Kunst*, 3. Folge, 6 22, no. 38, have been noted.

[33] Sidney Smith thought he had found written allusions, but this is not so. See S. M. Paley, *King of the world*, 23–24.

[34] The closest parallel is the ' plant ' (*šammu*) which Gilgameš plucked from deep in the Apsû according to the Babylonian *Gilgameš Epic*, XI, 266 ff. Eating this plant provided rejuvenation, as shown when, in the story, the snake swallowed it and sloughed its skin. However, the differences are considerable. It grew deep under water (Honor Frost identifies it as black coral), not in a garden on land; it was a plant, not a tree; one ate the plant and not its fruit; and the eating provided a single rejuvenation, not immortality. Since this plant grew under water it is most unlikely that it served as the symbol of the storm god, whose outpourings nourished the vegetation on earth. The Akkadian phrase *šammu balāṭi* does not mean ' plant of life ', which can then be stretched to ' tree of life ', but ' curative drug '.

other. It will be everywhere agreed that sometimes they are related, sometimes not. For example, in a presentation scene a standing deity or human is introduced to a seated deity by a minor deity. The three figures compose one scene. However, in the sky above them there may appear a crescent and one or both of two distinct discs, which represent the moon god, sun god and Inanna/Ištar, respectively. These astral symbols, of which one, two or all three may appear, are unrelated to the introduction scene beneath. If, for example, only the lunar crescent appears, it does not serve to identify any of the major figures as the moon god. Apparently the astral symbols are in the nature of filling motifs and serve to bring the presence of the signified gods into the seal and its use, whatever may be the meaning of the main scene. Where the ancient seal cutters had a *horror vacui* and fill every possible gap with something, as is the case with the Anatolian and Syrian seals involved here, it is much harder to judge what is related conceptually and what is placed in position to gratify some artistic sense. Presumably the ancient craftsmen and their clients understood the meaning (if there were one) of all the items used, and so did not need to have a lucid arrangement which would help to make the designs self-explanatory for posterity. Williams-Forte relates more things in these seals than we consider demonstrably correct, and draws conclusions from juxtaposing which may result from the artist's sense of propriety alone.

The clearest of the scenes of concern are those on Syrian seals showing Baal spearing a normal snake with a normal spear.[35] The god may stand with one foot on each of two mountains, or he may be standing on flat earth, as it were. Rarely, the ' spear ' above the hand holding it is Baal's plant or tree,[36] which is reminiscent of Baal's spear on the famous stele from Ras Shamra, the shaft of which resembles a trimmed tree or branch.[37] On seals one could question whether it really is such an impractical weapon. It could be argued that, due to the small scale, an actual spear is meant by the rod beneath the hand, and the flourishing vegetation above is meant as an entirely separate symbol: their ends are not depicted. In favour of this interpretation, cases where Baal holds in the same hand forked lightning above and the reins of his bull beneath may be cited.[38] One does not normally see the end of the lightning below, or the end of the reins above the hand. This is due entirely to the small scale of the depiction and no one so far has suggested that the lightning is the other end of the reins. On the Ras Shamra stele, however, the thorough trimming of the upper portion suggests the tree has been hacked to make it appear a more plausible end of the

[35] G. A. Eisen, *OIP*, 47, no. 158 = E. Williams-Forte, *The Metropolitan Museum of Art. Ancient Near Eastern Seals: A selection of stamp and cylinder seals from the collection of Mrs. William H. Moore*, no. 34; also MMA, 68.57.1 (unpublished, see the note on the last cited reference at the end under ' NO. 34 ', and p. 28[57] of Williams-Forte's article in *Ancient seals and the Bible*), and *Collection de Clercq*, I, 295.

[36] Williams-Forte, op. cit., p. 40, figs. 8–10. However, the drawing of the Louvre seal in fig. 9 somewhat distorts. On the photograph of the impression in Delaporte's Louvre *Catalogue*, II, A 918, the trunk of the tree is not in line with the snake's open mouth, and it does not continue below the hand that holds it, while something projects from the snake's open mouth, apparently a forked tongue. The drawing of fig. 8 also indicates the tree's continuing through the holding hand into the snake's open mouth, but although the alignment is correct in this case, there is in fact a rough break in the surface of the stone between the hand and the snake's head (confirmed by autopsy with powerful lenses), so the point of contact (if any) is lost. The third seal presented as showing this feature, fig. 10, is only known from the drawing offered. It appears to show quite clearly the snake being speared, though the angle of the tree and that of the object spearing the snake below the hand is not quite the same.

[37] Williams-Forte, op. cit., p. 42, fig. 15. and often reproduced.

[38] Özgüç, nos. 11–13, etc.

spear. Williams-Forte, accepting without discussion that a single object is meant, calls it ' the lightning tree ' from an Ugaritic passage:

sbʿt.brqm.x[. . .] t̠mnt.iṣr rʿt. ʿṣ brq.y[. . .]
KTU, 1.101 3–4

Seven lightnings .[. . .], eight stores(?) of (?) . . . he(?)
[. . .] the tree of(?) lightning.

This is obscure because the meaning of *rʿt* is unknown, and the incompleteness of the final word quoted means that while ' tree of lightning ' is possible, the two words could be related in some other way. Trees and lightning have so little in common that the phrase as rendered is curious. A second passage referred to in this connection is:

ʿn.bʿl.qdm.ydh	The eye of Baal precedes his hand
k tǵd̠.arz.b ymnh	when the cedar/pine is . . . in his right hand.
KTU, 1.4 vii 40–41	

In the context this certainly refers to Baal attacking, perhaps by throwing a spear, though some uncertainty is created by the verb of unknown meaning in the second line. However, the tree named need not imply a whole tree as in nature, but might refer to a weapon made of its wood.

In art Baal on occasions holds up a tree without there being any snake apparently impaled on it,[39] and in these cases it is certainly a symbol for identification. Its use as a weapon is not completely sure.

The snake, as already observed, is entirely naturalistic and so gives no hint of its name and identity. Williams-Forte proposes that it be identified with the Ugaritic Mot, god of death. One argument for this proposition is that two Anatolian-style seals from Kultepe impressions show Baal holding a limp snake by the neck while its tail is hidden within two mountains on which Baal's foot rests,[40] so the mountains, signifying the nether world, are the snake's home. This, we suggest, is again over-interpretation of juxtaposition in art. The end of the snake does indeed abut upon the mountains, but its visible length does not suggest that any substantial part is invisible. On a Syrian seal (Williams-Forte, op. cit., fig. 10), which shows Baal spearing the snake apparently with the tree, the end of the snake again abuts upon the mountain, but is thinner at the point of contact, so there is no reason to suspect that any part of it is meant to be understood as inside the mountain. In the cases where there is no visible thin-

[39] See n. 3.

[40] Williams-Forte, op. cit., 25 ff. However, there is a third, similar Anatolian Group impression of Baal holding the limp snake where the end might touch the mountain: Özgüç, no. 70 = T. and N. Özgüç, *Kultepe Kazisi Raporu*, 1949, pl. 64, no. 718. Also an actual seal of this type not noticed is *CANES*, 894, where the lower part of the snake, correctly identified as such by E. Porada, is not visible due to damage. No. 42 in the Seyrig Collection, a seal published for the first time by Williams-Forte, op. cit., pl. 1, fig. 2 and on the cover, is described by her as ' Syrian ', but though it obviously draws on Syrian motifs and shows Baal with one foot on a live snake, it is equally obviously not of Syrian workmanship. The details of execution are not typically Syrian, and, in contrast to Syrian workmanship, the engraver had no idea how to fill the space. Note how the tree, whirling weapon and bird overlap while there is abundant empty space elsewhere. Also, if the combined lunar crescent and disc are really meant to be Baal's headgear, as they appear to be, this is totally inconceivable in the world of Syro-Mesopotamian religion. The combined crescent and disc were an accepted grouping of the symbols of the sun god and moon god, but no one figure, human or divine, could properly carry both on his head. However, technically, the engraving is well done and one is forced to the conclusion that either this is an ancient seal cut in an area where Syrian art was known but not understood, or it is a modern forgery.

ning of the body, it is possible that the artist meant the end to be thought of as behind the mountain, not inside it, if indeed one should press such questions.

The mountains are not so obscure. In well-known Hittite art, such as Yazilikaya,[41] Teshub stands on two mountain gods named Namni and Ḫazzi, both real mountains, though only the latter is certainly identified, as the classical Mons Casius in north Syria. This is in fact Baal's one mountain in the Ugaritic texts, there under the same Ṣapānu, which passed into the Old Testament as Ṣāphōn. Why, then, on Syrian seals, is Baal shown with his feet on two mountains, which was the Anatolian tradition? It is always possible of course that the artistic motif originated in Anatolia and was borrowed in Syria, where the literary tradition accepted only one. In any case the two could be considered peaks of a single mountain: one for each foot. Also two Syrian seals do not support the common type: no. 476 of the Marcopoli Collection [42] shows Baal standing on a single, undivided block of mountain, and *CANES*, 968 shows the two feet on one peak each, but inserts a higher peak connecting the two shorter ones. The mountains Ṣapānu and Namni are not known to have had nether-world connexions,[43] so the idea that the snake defeated by Baal in art is Mot cannot be sustained on this ground. There is one Ugaritic passage naming two mountains:

ʿm.ǵr.trǵzz / ʿm.ǵr.ṯrmg	toward mount *trǵzz*, toward mount *ṯrmg*

KTU, 1.4 viii 2–3

From the context it is clear that these are two mountains on the edge of the world by the entrance to the nether world. However, it would be entirely wrong to identify the two mountains beneath Baal's feet in art with these. In the story Baal sends envoys to this remote region, not going himself, and since in art Baal most commonly stands on the two mountains without there being any trace of a snake, they can only be meant to identify him, and for that Ṣapānu in Syria and Namni and Ḫazzi in Anatolia are clearly meant.

There are unambiguous references to Baal's defeat of a snake in the Ugaritic myths: [44]

k tmḫṣ.ltn.bṯn.brḥ	When you smote *ltn*, the . . . snake,
tkly.bṯn.ʿqltn.	finished off the twisting snake,
šlyṭ.d.sbʿt.rasm	*šlyṭ* of the seven heads . . .

KTU, 1.5 i 1–3

[41] Also on Hittite seals: *AnSt*, 25, 144–5, figs. 1–4; C. F.-A. Schaeffer, *Ugaritica*, III, pp. 24 f., figs. 32–3; pp. 48 f., figs. 66–7; p. 50, figs. 68–9.

[42] B. Teissier, *Ancient Near Eastern cylinder seals from the Marcopoli Collection*, 242; cf. T. J. Meek, *BASOR*, 90 25, no. 2. An address in Hurrian (found at Boghaz-köy) to Teshub of Aleppo (*KUB* 47 78, see H.-J. Thiel and I. Wegner, *Studi Micenei ed Egeo-anatolici* 24, 1984, 187–213) connects him in i 3 with Namni and Ḫazzi: *nam-ni-ra-am ḫa-zi-ra-am* ' You with Namni, you with Ḫazzi '. This address was presumably recited during rites somewhere, but not necessarily in Aleppo. But one would expect the priests of Teshub in Aleppo to be familiar with its content, in which case the Hurrian tradition of the two mountains of Baal would have co-existed in Syria with the Semitic tradition of one mountain at this time. The god in question under his Semitic name is probably known from the Ebla archive as: ^{d}*à-da* (lú) *ḫa-lam*^{ki} (G. Pettinato, *OA* 18, 1979, 209, etc.) ' Adda of (the place) Ḫalam '. There seems to be no reason why Ḫalam at Ebla should not be Aleppo.

[43] In the Ugaritic Baal texts a battle takes place between Baal and Mot on this mountain, but it is clearly Baal's home, not Mot's; see R. J. Clifford, *The Cosmic Mountain in Canaan and the Old Testament*, 59–60.

[44] Mot is addressing Baal in the first excerpt quoted, mentioning the latter's victories. In the second excerpt Anat is addressing Baal, and from the context it is clear that she is not claiming for herself victories that were in fact Baal's, but is meaning that she assisted Baal in his achieving of them.

On the view that *ltn* and *šlyṭ* are names, we take the first two lines to refer to a single snake, the third to a separate monster. This interpretation is confirmed by a listing of more of Baal's enemies in another text:

mḫšt.btn.ʿqltn	I smote the twisting snake,
šlyṭ.d.sbʿt.rašm	*šlyṭ* of the seven heads . . .
KTU, 1.3 iii 41–42	

The lack here of the first line of the previous quotation when the listing in the whole context is much fuller implies abbreviation in wording but not in substance. This conclusion is confirmed by the later use of this language as metaphor in Isaiah 27:1: *ʿal liwyātān nāḥāš bārīaḥ weʿal liwyātān nāḥāš ʿaqallātôn* ' against Leviathan, the . . . snake, yes, against Leviathan, the twisting snake '. This, then, is presumably the snake being speared by Baal in art, and there is so far no ground for identifying it with Mot.[45]

Neither the Syrian and Anatolian art, nor the Ugaritic texts explain the background of this battle, so there is no basis for comparing this snake with the seducer in the garden of Eden. Snakes are too common in both the art and the literature of the ancient Near East for this one to have particular relevance to Genesis, though it is the basis for certain Hebrew poetic imagery.[46]

One further possibly related item occurs on the Anatolian-style seals known from impressions on Kultepe tablets for the most part. Baal often stands with his back against what might be described as a tree in cross-section. It has a vertical ' trunk ' which normally tapers slightly toward the top, and on the side away from Baal parallel strokes extend from its side, usually on the upper part only, suggestive of branches. In detail the known examples vary considerably.[47] Williams-Forte describes them, following Özgüç, as ' " cones " that rest on the backs of bulls supporting the weather god ' (p. 26). This is misinterpretation of juxtaposed items. On some occasions the bulls in question are standing in front of the mysterious objects, so that their lower portions are hidden, but there are sufficient examples where this is not so and their bases are then exposed.[48]

[45] Psalm 74 : 14 has a plural ' heads of Leviathan ' in the Masoretic text, which would exclude the Anatolian and Syrian depictions as showing this creature. However, the plural depends entirely on a *mater lectionis*, and there is a little LXX evidence for the singular ' head '. The Leviathans of Job 40 : 25 and Psalm 104 : 26 are generally agreed to be real animals, to be distinguished from the one named in Isaiah 27 and Psalm 74.

[46] In Sumerian and Akkadian the god whose name is written with the sign MUŠ (' snake '), to be read either Niraḫ or Irḫan, is the cosmic river, and little narrative myth about him can be found. For the reading of the name see G. J. P. McEwan, *Or.* 52, 1983, 215–29, and M. Krebernik, *Die Beschwörungen aus Fara und Ebla*, 298–300. The former assumes, doubtfully in the view of the present writer, that the sign-group DIN.BALAG.DAR, etc., joins with MUŠ as one logogram for Irḫan. More likely the signs add up to a second element of the name. McEwan prefers Niraḫ as the normal form because (i) this was asserted by Landsberger, (ii) because it is proved for Old Assyrian personal names, and (iii) because an exercise tablet from Ur quoting Šurpu writes ^{d}*ni-ra-ḫu* for ^{d}MUŠ of other copies. But the Old Assyrian writing system is so distinctive that one should not extrapolate from it for the Babylonian literary tradition, and an exercise tablet is never the safest authority for anything. The present writer suspects that the normal Babylonian literary reading is Irḫan, because of the bulk of the evidence in favour of it, not all of which is quoted by McEwan, who, having asserted on his first page that ^{d}MUŠ = Niraḫ, assumes that this is true everywhere throughout the rest of the article. Since *niraḫu* is a common noun in Akkadian for ' small snake ', it could have been used as an epithet of the snake-god.

[47] See Özgüç 17, 19, 21, 26, 28, 29, 30, 39, 64, 65, 70, 71; B. Hrozný, *ICK*, I, pl. lxv 35a C; L. Matouš and M. Matoušová-Rajmová, *Kappadokische Keilschrifttafeln mit Siegeln* (henceforth ' *KKS* ') p. 181 105; *CCT*, VI, pl. 49 14; O. White Muscarella, op. cit., no. 128; L. Speleers, *Catalogue des intailles . . . des Musées Royaux d'Art et d'Histoire*, Supplément, 153.

[48] L. Speleers, op. cit., loc. cit.; B. Hrozný, *ICK*, I, pl. lxv 35a C; O. White Muscarella, op. cit., no. 128.

Also, the shape does not justify the term ' cone '. There are things which can legitimately be called cones on the backs of bulls on seals of the ' Old Assyrian Group ' especially,[49] but the item under discussion is totally unrelated. Williams-Forte further interprets the impressions showing Baal holding a limp snake as showing the snakes with ' a branch-like element ' rising from their heads ' probably representing the god's lightning ' (p. 26). The ' branch-like ' element is what we consider the ' branches ' extending from the side of the ' trunk ', and the ' trunk ' in these cases is not shown as hidden by Baal's back. In our view it is coincidence that the snake's head is adjacent to the lowest ' branch '. The correctness of this interpretation of the ' branches ' in the three cases where no ' trunk ' is visible is confirmed by the occurrence of almost vertical parallel lines above and in front of Baal's head in one of these cases.[50] These lines occur commonly with the ' tree ' which serves as a backdrop to Baal. As with other aspects of this setting for the god, there is considerable variation in detail. In Özgüç 29 there are in fact two ' branches ' above Baal's head which match the many more on the opposite side of the ' trunk ', and in addition there is the block of vertical strokes which reach down in front of Baal's face. They are clearly not part of the ' tree '. But on Özgüç, 39 they are so similar to the ' branches ' that they look related to the ' tree '.[51] Also, an oblong object appears beneath them. On a stamp seal from Açemhöyük,[52] a single line runs the full length of the back of the ' trunk ', then bends over to create a ' bower ' in which Baal stands on his bull. From this line there are two blocks of parallel strokes, clearly intended to look alike: one from the back of the ' tree ', the usual ' branches ', the other from above and in front of the god, which end in an oblong object. It is very doubtful whether this backdrop for the storm god represents any natural object. It might have been a cultic setting for statues of the god in ancient shrines, whether the ' tree ' was an object manufactured so to serve, or whether the wall behind the statue and the ceiling above were decorated in this way.[53] Williams-Forte suggests that the lines above Baal may represent rain, and this is possible, though if accepted, we would feel that the almost horizontal lines behind Baal would then also have to be considered a representa-

[49] e.g. *CANES*, 855–62.

[50] Özgüç, 70, 71 and *CANES*, 894 are the three, and Özgüç, 71, has the nearly vertical lines above.

[51] There are several distinct kinds of tree held by Baal, and one (T. and N. Özgüç, *Kultepe Kazisi Raporu*, 1949, pl. 62, nos. 691–2), consisting of a central pole with a narrow oblong or wavey band at the top and upturning protrusions just beneath, seems to be the same as a sort of standard in Mitanni seals (C. F.-A. Schaeffer-Forrer, *Corpus*, I, p. 100, 8.448 and p. 135, 23.479; E. Porada, *AASOR*, 24, no. 98), and what appears to be the top of this ' standard ' can appear as vertical lines descending from a top line on a short support (Schaeffer-Forrer, op. cit., p. 89, 6.389; Porada, op. cit., nos. 95 and 547; D. Collon, *The Alalakh cylinder seals*, no. 85; *Iraq*, 11, pl. xviii 123; *ZA*, 52 187, Abb. 77). In Mitanni seals both this and the common stylized tree can occur on one and the same seal (of the preceding list: Porada, 95; *ZA*, 52 187; cf. Collon, no. 75). This need not necessarily imply two different gods: in northern Mesopotamia and Syria local variants of the same god could receive offerings simultaneously from the same person. The relevance of this material here is that the band of parallel lines above Baal in his ' arbor ' resemble one side of the top of this symbol in Özgüç, 39, 65 and 71, but in view of the difference in time it would be unwise to affirm a connexion without further evidence. Another type of tree has three to five pairs of branches (Williams-Forte's figs. 8–10 and 13; also Schaeffer-Forrer, *Corpus*, I, 62 A9), and this tree is held by a seated god on an Akkadian seal (*BN*, 79), where a reared-up goat rests its front paws on the seated god's knees, cf. Briggs Buchanan, *Early Near Eastern seals*, 473. It is not clear whether the goat is meant to be eating the foliage or serves only as further identification for the god. There seems to be no way of determining whether this god is Adad. The Yale seal shows him holding what Buchanan interprets as ' three ears of grain ', but they could equally be three twigs.

[52] N. Özgüç, apud E. Porada (ed.), *Ancient art in seals*, p. 94, III–24.

[53] It is worth recalling that the Hebrew cult symbol Ashera was of wood, and was erected at altars. Some scholars have thought it was a tree or stump.

tion of rain, which is less probable. So for the present there is no sure interpretation of the ' bower ' of Baal, though because it occurs with no other deity and because Baal never holds a tree in his hand when standing with this backdrop, it is possible that it was meant as a stylized tree to identify the god.[54]

In the preceding discussion we have oversimplified by using the name Baal for the storm god in both Syria and Anatolia, though it is only correct for the former area. J. H. Deighton's study (see n. 15 above), whatever its limitations, should caution us against too ready an identification of storm gods, even in adjacent areas, in all their aspects and attributes. Anatolian Tarḫunna, if that was in fact his name, may have differed in some particulars from Syrian Baal. Williams-Forte's work covered not only storm gods, but also water gods, though in the published article very little space is devoted to a god of terrestrial water. As with the storm god, one important observation is made, though again it cannot be accepted without considerable qualification. All the figures depicted in the Anatolian Group seals need a detailed treatment, which would easily occupy a whole book. N. Özgüç made a brief initial survey (pp. 59–74), but though it was a useful start, it was too brief, faulty in some of its observations and conclusions, and did not go into necessary ramifications of the background. We have no intention to treat the whole subject at length, but since one figure has been singled out and identified as a water god, we shall deal with water gods alone. The owners of Anatolian Group seals were normally Assyrian traders living in Cappadocia. It appears that there were no skilled seal cutters trained in Mesopotamian glyptic working in Cappadocia, as one assumes there were in Assyria. Thus locally trained stone engravers were employed there to cut seals. The various groups distinguished: Özgüç's Old Assyrian, Old Babylonian (Porada's Provincial Babylonian), Syrian Colony and Anatolian Group, are styles developed by schools of craftsmen, all no doubt working in Anatolia. While the Old Assyrian style contains some purely Anatolian motifs, it is generally characterized by crude copies of Mesopotamian motifs. Thus, while contemporary Syrian seals appear to reflect only Syrian ideology, with of course foreign influences at work in it, the seals cut for Assyrians in Anatolia need not reflect only current Anatolian ideas. Those have to be obtained by sifting out foreign elements (as distinct from foreign influences at work in Anatolian religion), and this is a delicate procedure.

The Anatolian Group is characterized by a glorious mélange of motifs from every quarter in vast quantity. Those borrowed from Mesopotamia are best known and so the easiest to disentangle. Thus the storm god, so identified from the forked lightning he may bear, stands variously on a plain or winged lion or on a bull.[55] The winged lion as the storm god's mount was taken directly or indirectly from the lion-griffin of Old Akkadian seals,[56] or other art forms of

[54] In *CANES*, 1094, an Old Syrian seal *c.* 2000 B.C., the bull, symbol of the storm god, stands on a podium behind which some kind of structure depicted in linear fashion rises and then bends over at right angles above the body of the bull. This might be related to the backdrop of Baal just discussed. Three Elamite seals from the first few centuries of the second millennium show a seated figure under a real tree or plant that rises behind the figure and bends over to form a sort of roof: P. Amiet, *Glyptique susienne*, 1899; J. G. Volk, *Habib Anavian Collection*, 125; London auction catalogue: Christie's, *Fine antiquities*, 12 Dec. 1984, p. 81, no. 318. While it is not impossible that the cultic structures of Elam and Anatolia had things in common, too little is understood of the Elamite depictions to make a serious comparison.

[55] *Passim* on a bull; on a lion, e.g. Özgüç, 2 and 9; L. Speleers, op. cit., p. 152; on a winged lion, Özgüç, 11–13. Of these last three the first has a vestigial wing, while the other two show a rearrangement of the Akkadian wings which serves as a kind of footstool. However, the drooping heads of all these lions confirm their descent from the Akkadian prototype.

[56] R. M. Boehmer, *Die Entwicklung*, Abb. 362–374.

that period no longer extant. The bull appears in Old Babylonian and Syrian seals and was certainly associated with the storm god in Anatolia long before the Assyrian traders were settled. It seems that there are never two storm gods shown on a single seal, one on a bull, the other on a lion, so the craftsmen and their clients must presumably have understood the various glyptic traditions to refer to one and the same god. Another deity with a specific Mesopotamian background is Enki/Ea, god of the Apsû, a subterranean lake believed by Sumerians and Babylonians to exist beneath the earth, and to supply all springs with water. This concept seems peculiar to the Sumero-Babylonian world, so the attentions to the god in other cultural areas such as Anatolia demand explanation. A Mesopotamian Enki/Ea is not easily identified in the Anatolian Group since the associated streams of water and fishes found in Akkadian art occur very rarely in this Anatolian material with a suitable figure. However, his symbolic animal in Mesopotamia, the fish-goat, which is used to identify him in Old Babylonian seals, where it shows up under his feet, similarly appears to identify the deity in the Anatolian Group.[57] Since it is apparently never so used in Akkadian art, and very rarely in Ur III,[58] it reflects a different stage of Mesopotamian art from the storm god's lion. Two minor gods from Ea's court are more readily identified in the Anatolian Group: his double-faced vizier Isimu/Usmû and the bull-man.

Unlike the fish-goat, the two-faced vizier commonly occurs on Akkadian seals, but is totally absent from Ur III, Old Babylonian and, apparently, Syrian seals.[59] However, the Anatolian artists may identify this deity, not only by his double face, but also by streams of water flowing from his body (Özgüç, 1, 3), a device used with Ea but not with his vizier in Akkadian seals. So the Anatolians correctly understood the two-faced figure as Ea's vizier, but decided that further confirmation of identity was necessary. Occasionally this deity stands on the back of a boar, something unknown in Mesopotamia, so obviously there was a local Anatolian god with whom Usmû was identified.

Another figure in the Anatolian group similarly identified by the flowing streams is the bull-man, a bull most commonly depicted as standing on two legs and having a human face, gud.alim in Sumerian, *kusarikku* in Akkadian. He has a long history in Mesopotamia, but in this context it is unnecessary to go back further than the end of Early Dynastic. Most commonly then and in the following Akkadian dynasty, he appears in contest scenes, and often his comrade there is the Laḫmu,[60] the nude hero with three curls either side of the face and a triple-stranded belt around his waist. Elsewhere in Akkadian glyptic the Laḫmu appears in association with Ea, holding the so-called gate-post, and later Sumerian literary texts attest a plurality of Laḫmus as Ea's constabulary. Also the god ' Laḫmu-of-the-Apsû ' is Ea's gatekeeper. The bull-man also appears on Akkadian seals holding the same gate-post, but not in association with Ea, though once with Shamash.[61] Indeed, he is elsewhere associated with Shamash not infrequently.[62] One Akkadian seal shows the sun god grabbing a bull-man from behind, and in another two, a pair of recumbent bull-men rest on the

[57] For Old Babylonian examples, see U. Seidl, *Bagh. Mitt.*, IV, 178 ff.; for the Anatolian Style examples see Özgüç, 14 (more fully in the drawing in *CCT*, VI, pl. 48 4) and 15.

[58] See U. Seidl, loc. cit.

[59] *RLA*, V, 179 ff.

[60] The Laḫmu has been certainly identified by F. A. M. Wiggermann, *JEOL*, 27, 1983, 90 ff., and a forthcoming monograph by him will take up the gud.alim/*kusarikku* and related matters.

[61] D. E. McCown and R. C. Haines, *Nippur*, I [*OIP* 78], pl. 109 11.

[62] See M. R. Behm-Blancke, *Das Tierbild in der altmesopotamischen Rundplastik*, 51.

mountain of the east as the sun god rises.[63] In Old Babylonian seals the bull-man appears under the feet of the seated sun god as identification (*CS*, XXVII a), and a standing one holding a pole surmounted by the solar disc occurs from Old to Late Babylonian times,[64] though pairs of bull-men may also occur holding symbols of other gods (*CANES*, 421, etc.).

Against this background it seems strange that in the Anatolian Group the bull-man, though occurring *passim* in a stereotyped contest with a single lion, also commonly appears (Özgüç, 5, 7, 8, 11, 32, 33, etc.) either standing or kneeling with streams of water coming from his shoulders or, rarely, waist (op. cit., 54), something apparently unknown in Mesopotamian art. The explanation is that these Anatolian artists have merged the bull-man and the Laḫmu. Mesopotamian evidence helps to explain this. In Akkadian, Ur III and Old Babylonian contests the two types often occur together, one each in matching pairs of lion or bovine versus Laḫmu or bull-man. Similarly, either may hold even the same standard, so their functions appear to coincide. Even their faces, when shown frontally, as most often, may be quite similar (e.g. *CANES*, 144). However, in Mesopotamia they are carefully distinguished, and in other than the Anatolian Group at Kultepe. The streams of water can appear with the Laḫmu in Old Babylonian seals (*CS*, XXVII k, XXVIII g, k), similarly on Syrian seals (e.g. Moortgat, *VR* no. 545), and in the Provincial Babylonian Group (*CANES*, 864; Louvre, A 884; *CCT*, VI, pl. 56 73, and 58 84). The penultimate of these is particularly important as showing a Laḫmu joined to the seated god with feet on fish-goat by a stream of water, while a clearly distinguished bull-man is grappling with a lion. Thus the Anatolian Group has made a break with its spiritual ancestry and with its contemporaries in merging the Laḫmu in the bull-man. The only slight concession to the absorbed figure is that occasionally the limbs of the bull-man below the waist are more human than bovine (e.g. Özgüç, 40: the contestant), though there is nearly always a tail. There was presumably something in the Anatolian world to explain this development, so any non-Mesopotamian features of the Anatolian bull-man must be scrutinized for indications. Rarely, the bull-man stands on the back of a bull (Özgüç, 32, 33), like Baal. Also rarely, pairs of bull-men hold up on a sort of tray the bull with cone on his back, a symbol from the Assyrian Group (Özgüç, 38–40), while a single bull-man similarly supports that unidentified symbol, the creature commonly called a mongoose, but perhaps a monkey (Özgüç, 67, 74). There is Mesopotamian background in bull-men holding up divine symbols generally, but not these particular items. The Anatolian background is seen at Yazilikaya, where Teshub's two bulls, Seri and Ḫurri, hold up the lunar crescent. In Tell Halaf relief sculpture and commonly in first millennium seals, Assyrian, Babylonian and Achaemenid, two bull-men hold up the winged solar disc.[65] There is one common denominator here: Baal as seen in the thunder clouds and lightning, and the moon and sun are alike phenomena of the skies. They needed support, which was a function of minor gods. It is therefore a reasonable conclusion that the known Hurrian tradition of the storm god's two bulls in his entourage is based on an older Anatolian tradition, in the light of which the Mesopotamian pair of Laḫmu and bull-man were merged in the one type, which

[63] Briggs Buchanan, *Early Near Eastern Seals*, no. 436; P. Amiet, *Glyptique susienne*, no. 1563; *Propyläen Kunstgeschichte*, XIV, p. 239, fig. 44d.

[64] e.g. H. Frankfort, *Cylinder seals* (henceforth '*CS*'), pl. xxvii k; *CANES* 366; *PBS*, XIV, 710. The last bears the inscription ^{d}*zi-kù*, a name of Marduk in Enūma Eliš, VII 19 and elsewhere, but it is difficult to believe that this bull-man is so being identified as Marduk.

[65] W. G. Lambert, *Iraq*, 41, 1979 35–6.

could appear in pairs when necessary. The Mesopotamian bull-men are not known to have had any connexion with Adad, so the Laḫmu with streams of water was also needed. How far this requires the conscious recognition on the part of the ancient Anatolians that the water here is terrestrial as connected with Ea, and so the storm god must have been concerned with such water, is a difficult question. But surely some of the ancients must have reasoned that the continual falling of water from the skies requires that the supply up there be replenished from time to time from water down here, and in this way the storm god would have been involved somehow with terrestrial water.

Teshub's two bulls holding up the moon have no Mesopotamian background. At first in Mesopotamia, two bull-men hold up the sun-disc on a pole, and this gives the impression of cultic practice. The statue of the sun god was far too precious to be freely available for devotions from the commonalty of the population, so symbols served, and mounted on poles they were most practical and portable. Mythologically, of course, minor gods carried them. This stage is commonly attested in Old Babylonian and Mitanni art, but in some Mitanni and Middle Assyrian art, followed by the first millennium art of Mesopotamia, there is most commonly no longer any pole and mythological figures support the winged solar disc by holding it up by the ends of the wings. This is presumably meant as a cosmological demonstration of why the sun does not fall from the skies, and we would argue that the change resulted from north-Mesopotamian influence of Hurrian origin. Reasons are that, as with the sacred tree, the texts are, it seems, completely silent on this pair of *kusarikkus* holding up the sun, which is inexplicable if it were a traditional Mesopotamian concept, and secondly that the Hurrian pair of bulls, Seri and Ḫurri, were worshipped at Assur [66] (and no doubt elsewhere in Mesopotamia) so that knowledge of this Hurrian and Anatolian concept was certainly around.

Thus the Anatolian Group offers three deities connected with water, apart from the storm god himself: the two-faced god, originally Ea's vizier, and the bull-man with merged Laḫmu which, in pairs, became divine bulls in the storm god's court. Williams-Forte would like to add one more to this group of gods with watery associations. She observes that, when Baal is shown standing on a bull, another deity similarly mounted quite commonly precedes him. This preceding deity, however, is never armed, but if holding anything, is holding a cup. It is argued that because of accompanying fish and streams of water he is a water god, of ' earthly, as opposed to heavenly, waters ' (p. 24). Apart from some inaccuracy in detail, this is substantially a questionable proposition. In the eleven examples of the unarmed god in front of Baal,[67] once a fish is equidistant from this deity's mount and a lion under the feet of the facing deity (Özgüç, 71), once a fish appears between this god's mount and the preceding deer (*KKS*, 181 105), and once there is an indistinct mark which could be a fish similarly between this deity's mount and the deer on which the god in front is riding (Özgüç, 65). Then, in Özgüç, 11, there appears ' the nude hero with streams that kneels on his rein ' (Williams-Forte, p. 25). In fact this is the bull-man (note the bull's ears and broad thighs) and his position above (sic!) Baal's reins is surely space-filling rather than a demonstration of trapeze artistry. As noted by Williams-Forte, two other seals, certainly from the same school and possibly from the same artist, show the nude goddess throwing back her cloak in

[66] R. Frankena, *Tākultu*, p. 92 75; B. Menzel, *Assyrische Tempel*, I, 67 and notes.

[67] Özgüç, 19–20, 26, 28, 31, 64, 65, 70, 71; *ICK*, I, pl. lxv 35a C; *KKS*, p. 181 105; L. Speleers, op. cit., 153.

place of the bull-man, that is, above the reins. She has no demonstrable connexion with water. Thus the alleged watery association of the unarmed god who precedes Baal is altogether doubtful, and other items which do commonly occur around the god as depicted, e.g. a bird, are ignored.

However, there remains the important discovery that this deity, whatever his identification, quite regularly precedes Baal in the Anatolian Group. The cup he often carries was borrowed from Mesopotamian art, but has no value for identification since in the Anatolian Group different types of gods can carry it. The dress is likewise shared by many gods and thus unhelpful. So, like Williams-Forte, we have to work from the lack of any weapon and his pre-eminence over Baal as shown by his preceding rather than following. Such precedence suggests at once paternity. It seems that no father of Tarḫunna is known in Hattian religion, but in the Hurrian sphere, Kumarbi is of course Teshub's father. Myths give virtually no information about his cosmic attributes, but he cannot be identified with the figure on a bull preceding Baal in the Anatolian Group. First, in the Hittite succession myth he seized power from his father Anu by force, and in the Ullikummi story he deliberately gave birth to the giant rock in the attempt to crush his earlier son, Teshub, who was king at the time, though this attempt failed. He was not a peaceful father of Baal to go in front of his son unarmed. However, this creates no difficulty because the Hurrian penetration of Anatolia occurred after the period of the Anatolian Group and these Hittite myths are clearly based on Hurrian stories, themselves blended from (probably) originally Hurrian material and Sumero-Babylonian mythology with an admixture of north-Mesopotamian elements.

However, the Ugaritic myths offer an equally valid basis of comparison. Here, though Baal is frequently called 'son of Dagān', El is referred to as his father, and later Phoenician sources both confirm and suggest an explanation of this apparent contradiction.[68] In the Ugaritic myths El is the most senior god and rules the younger generation like a benign patriarch. Though bearing the epithet 'bull' (*ṯr*) he is no warrior. This fits so perfectly the figure who precedes Baal in the Anatolian Group that it justifies a hypothesis that in Hattian religion at Kultepe the storm god's father corresponded to El in Syrian religion. The Ugaritic texts are of course known only from copies written half a millennium later than the Anatolian Group, though the traditions they present may, of course, be much older. The evidence of Ebla from about the middle of the third millennium shows that some of the gods of the Ugaritic pantheon were already well established more than a millennium earlier: Adad, El, Dagān and Resheph, to cite the best known and most easily identified. The biggest known factor making for change in Syria over this millennium was the arrival of the Amorites at about the end of the third millennium. They brought a new name for the moon god, Yrḫ, but, being nomads, may have not altered fundamentally the established cults of the sedentary population. Thus it is entirely possible that the positions of El and Baal in the Ugaritic pantheon may reflect a status quo of great antiquity, and that they had close parallels in Anatolian religion. We would not press El's Ugaritic epithet 'bull' in this connexion, but would compare the way in which the *mušḫuššu* serves as the symbolic animal of both Marduk and his son Nabû in Mesopotamia.

One further question must be asked. If, as we propose, the two deities in sequence both riding on bulls are father and son, should they not have some common attributes? The son is certainly god of the upper cosmic water.

[68] H. W. Haussig (ed.), *Wörterbuch der Mythologie*, I. 255 f.

According to the Ugaritic myths El lived in ' the sources of the (two) rivers, within the springs of the (two) seas ' (*mbk nhrm qrb apq thmtm*), which is the nearest Syrian equivalent to the Sumerian Apsû. In considering the Mari pantheon, the present author, independently of any Anatolian considerations, concluded that Enki/Ea at Mari was a cover-name for El of the Syrian pantheon.[69] Perhaps, then, Williams-Forte was right to identify this god as a water god, if for the wrong reasons. However, more Anatolian evidence must be awaited to settle this matter.

In conclusion, it is clear that Williams-Forte has made two observations of major importance: that Baal occasionally carries a tree as an identifying symbol, and that a particular unidentified god precedes him heraldically in the Anatolian Group. Certain details of the presentation may be disputed, and the relevance of the tree and of the snake killed by Baal for the garden of Eden has yet to be established. But in other aspects of ancient Near Eastern art and religion these observations may prove to have far-reaching consequences.

[69] In ' The Pantheon of Mari ' to appear in *MARI*, IV.

Gilgamesh and the Magic Plant

Ronald A. Veenker

An episode in the Gilgamesh Epic is interpreted as an earlier, singular response to the puzzling lengthy generations of the antediluvian heroes in Mesopotamian tradition.

For many years scholars have been preoccupied with the literary history and structure of the Gilgamesh Epic (Kramer 1944). It appears that much of the eleven-tablet Akkadian version is based upon several independent Sumerian stories which are much shorter than epic length. They are "Gilgamesh and the Land of the Living," "Gilgamesh, Inanna, and the Bull of Heaven," "The Death of Gilgamesh," "The Deluge," and "Gilgamesh, Enkidu, and the Netherworld." A Semitic author, presumably during the Old Babylonian period, added to elements of the six Sumerian tales other legendary material of uncertain origin and wove the entire composition around the theme of immortality (Jacobsen 1976: 208-19; Kramer 1944: 18-19). Only the barest essentials of the original plots and characters remain.

In addition to the six Sumerian stories, the larger Akkadian epic contains material whose origin remains a mystery. Besides the famous flood story, the eleventh tablet of the Gilgamesh Epic presents three short episodes based on a motif one might entitle "squandered opportunities for immortality." The first relates a contest between Gilgamesh and the "gods of slumber" (XI: 197-233; see *ANET*: 95-96); the second has been called "a bath in the Fountain of Youth" (XI: 234-57; see *ANET*: 96 and Oppenheim 1964: 263); the third episode and focal point of this paper is called "Gilgamesh and the Magic Plant" (XI: 258-300; *ANET*: 96-97).

In the course of the first ten tablets of the epic, Gilgamesh has found his way with great difficulty to paradise (which in one part of the epic is surrounded by the "Waters of Death"). He has been told previously that Utnapishtim, the only human ever to obtain immortality, resides there. Surely Utnapishtim will disclose to him the secret of eternal life. Tablet XI opens with Gilgamesh posing his important question. In response, Utnapishtim fills the first 196 lines of the tablet telling how he survived the great flood and was granted immortality by virtue of his heroic feat. After hearing the story, Gilgamesh realizes his quest for immortality is in vain. Alas, he cannot duplicate the heroic feat of Utnapishtim, for the gods have repented of any further destruction of the world by deluge. However, hope is held out to him in a contest: Utnapishtim suggests that if Gilgamesh can resist sleep for six days and seven nights, the gods might grant him immortality. In a moment we realize that there is to be no real contest. No sooner does our hero settle to his haunches when "sleep, like a fog, blows upon him" (XI: 200)—a grim reminder of his mortality.

Following the contest, the author abruptly presents the second tale, the puzzling "Fountain of Youth" narrative (XI: 234-46):

> Utnapishtim [says to him], to Urshanabi, the boatman:
> "Urshanabi, may the landing pl[ace not rejoice in thee],
> May the place of crossing renounce thee!
> To him who wanders on its shore, deny thou its shore!
> The man thou hast led (hither), whose body is covered with grime,
> The grace of whose members skins have distorted,
> Take him, Urshanabi, and bring him to the washing-place.
> Let him wash off his grime in water clean as snow,
> Let him cast off his skins, let the sea carry (them) away, that the fairness of his body may be seen.
> Let him renew the band round his head,
> Let him put on a cloak to clothe his nakedness,
> That he may arrive in his city,
> That he may achieve his journey.
> Let not (his) cloak have a moldy cast,
> Let it be wholly new."

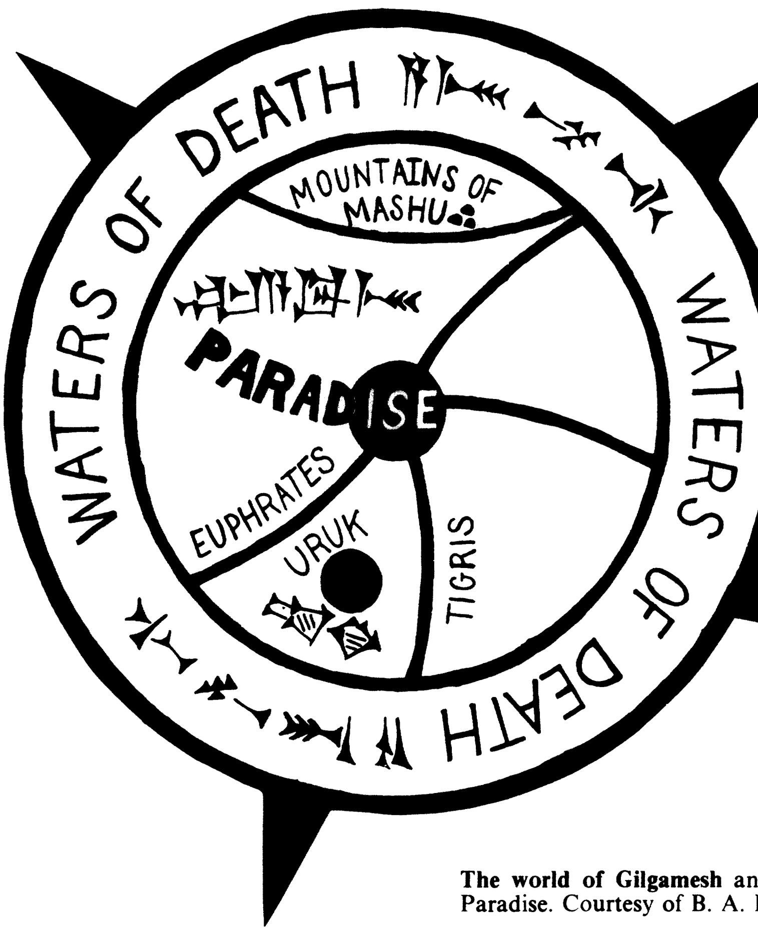
After renewing himself in the mysterious waters, Gilgamesh boarded the boat with Urshanabi and set sail for home. That the Neo-Assyrian scribes considered this "fountain of youth" story an independent piece is indicated by the traditional horizontal lines separating it from what precedes and follows.[1]

We now come to the third episode, "Gilgamesh and the Magic Plant" (XI: 256-300):

> Gilgamesh and Urshanabi boarded the boat,
> [They launch]ed the boat on the waves and they sailed away.
> His spouse says to him, to Utnapishtim the Faraway:
> "Gilgamesh has come hither, toiling and straining.
> What wilt thou give (him) that he may return to his land?"
> At that he, Gilgamesh, raised up (his) pole,
> To bring the boat nigh to the shore.

Utnapishtim [says] to him, [to] Gilgamesh:
"Gilgamesh, thou hast come hither, toiling and straining.
What shall I give thee that thou mayest return to thy land?
I will disclose, O Gilgamesh, a hidden thing,
And [*a secret of the gods* I will] tell thee:
This plant, like the buckthorn is [its . . .].
Its thorns will pr[ick thy hands] just as does the *rose*.
If thy hands obtain the plant, [thou wilt find new life]."
No sooner had Gilgamesh heard this,
Than he opened the *wa[ter-pipe]*,
He tied heavy stones [to his feet].
They pulled him down into the deep [and he saw the plant].
He took the plant, though it pr[icked his hands].
He cut the heavy stones [from his feet].
The [s]ea cast him up upon its shore.
Gilgamesh says to him, to Urshanabi, the boatman:
"Urshanabi, this plant is a plant *apart*,
Whereby a man may regain his *life's breath*.
I will take it to ramparted Uruk,
Will cause [. . .] to eat the plant . . . !
Its name shall be 'Man Becomes Young in Old Age.'
I myself shall eat (it)
And thus return to the state of my youth."
After twenty leagues they broke off a morsel,
After thirty (further) leagues they prepared for the night.
Gilgamesh saw a well whose water was cool.
He went down into it to bathe in the water.
A serpent snuffed the fragrance of the plant;
It came up [from the water] and carried off the plant.
Going back it shed [its] slough.

Thereupon Gilgamesh sits down and weeps,
His tears running down over his face.
[He took the hand] of Urshanabi, the boatman:
"[For] whom, Urshanabi, have my hands toiled?
For whom is being spent the blood of my heart?
I have not obtained a boon for myself.
For the earth-lion have I effected a boon!
And now the tide will bear (it) twenty leagues away!
When I opened the *water-pipe* and [. . .] the gear,
I found that which has been placed as a sign for me: I shall withdraw,
And leave the boat on the shore!"



The world of Gilgamesh and the map of Paradise. Courtesy of B. A. Bowles.

The purpose of this discussion is to show that (1) the story of the magic plant was once separated from the larger epic, and that (2) although it enhances the motif of "squandered opportunity for immortality" within the epic, it was originally a story about antediluvian longevity.

That this story existed apart from the larger epic can be seen by examining the transitions between it and the tale immediately preceding. Lines 256-57 inform us that, after washing in the mysterious waters, "Gilgamesh and Urshanabi boarded the boat, [they launch]ed the boat on the waves (and) they sailed away." This statement indicates that at one time the preceding portion of the epic ended with the return to Uruk immediately following the episode of the "fountain of youth."

The legend of the magic plant begins as Utnapishtim's spouse supports Gilgamesh, begging her husband to give our hero one more opportunity to find the life he seeks. In order to add this last tale to the epic, the author must bring the boat back to the shore (ll. 261-62)—a rather obvious but necessary literary ploy. Further evidence of the story's independence is found in the discrepancy between the description of the waters of Paradise here and another description found in Tablet X, column 4. According to the latter passage, Gilgamesh and Urshanabi, the ferryman, must cross the dread Waters of Death in order to reach Utnapishtim in Paradise. Should just one drop of those waters touch our hero he would certainly die (*ANET*: 92). The waters of the story in Tablet XI are clearly nontoxic, for Gilgamesh, without a moment's hesitation, dives into them (ll. 271-73). Furthermore, the fact that the magic plant has been continually nourished by these waters demonstrates their benign nature.

It appears, then, that the episode of the magic plant, while serving to dramatize the ultimate failure of Gilgamesh's quest, was *borrowed* and *adapted* to fit the themes of the Gilgamesh Epic. Questions immediately arise: What did the story teach before it was woven into the epic? How

might the ancients have entertained themselves with the tale? What sort of narrative could be concocted from the ingredients: Magic Plant, antediluvian hero, and deep water? The structure of the story, in its present form, remains sufficiently unaltered that one may reconstruct its original elements.

My thesis is that the tale of the magic plant, removed from its context in the Gilgamesh Epic, is a myth which offers an explanation for the extraordinary longevity of the antediluvians. In no other extant tale have the Mesopotamian writers given so much as a hint regarding the basis for their belief in the incredibly long-lived forbears. The well-known Sumerian King List (Oppenheim 1969: 265-66) records the reign of eight kings in five cities before the "flood swept over" the earth. The shortest regency is that of Ubar-tutu in Shuruppak: 18,600 years; the longest is En-men-lu-Anna in Bad-tibira: 43,200 years! Before such political tenure, the longevity of biblical Methuselah pales to insignificance.

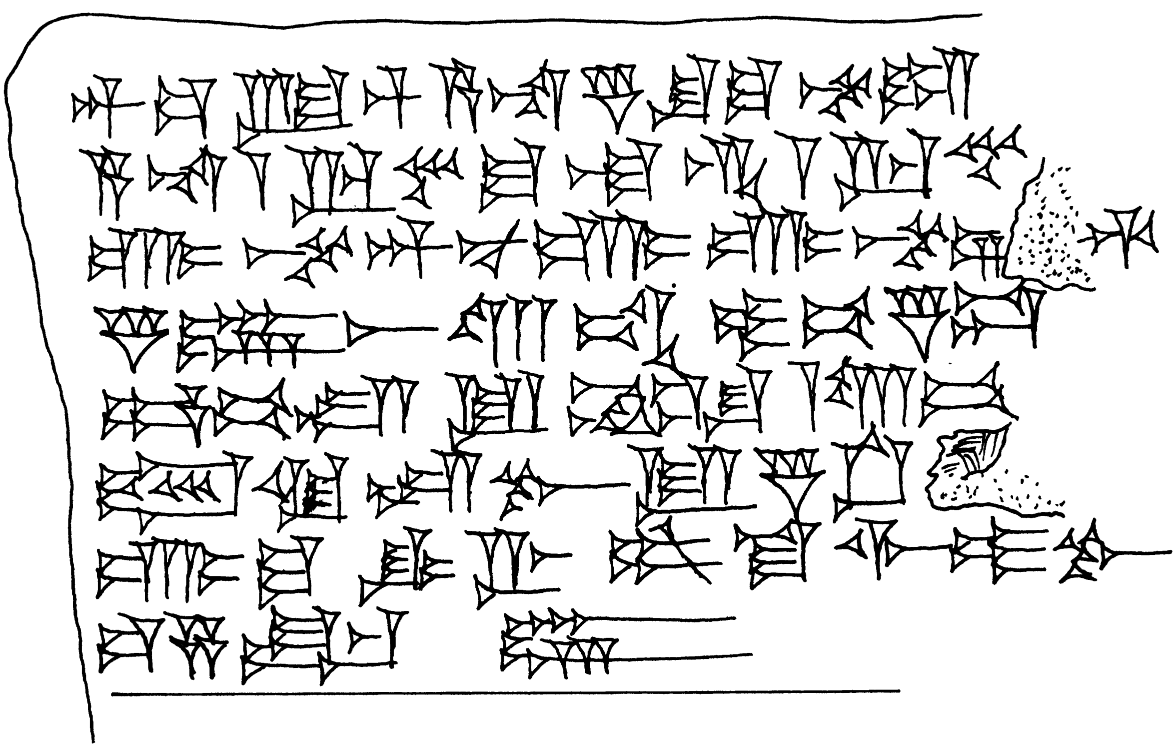
First, let us consider the famous antediluvian Utnapishtim, the central figure in the tale. His presence is necessary to provide the link between the civilizations before and after the deluge. The poet tells us at the very beginning of the epic that Gilgamesh "brought back knowledge from times before the flood," and that "he saw the abyss," i.e., the watery deep (I: i: 6). No other figure from the literature of ancient Mesopotamia could reveal to us the secret of the extreme longevity enjoyed by those mysterious kings of the ancient Sumerian city-states.

Second, notice that the plant does not offer the boon of true immortality which Gilgamesh seeks throughout the epic, but merely the sop of rejuvenation: "Its name shall be 'Man Becomes Young in Old Age' " (XI: 281). The motif of longevity is certainly more correctly applied to antediluvians than to Gilgamesh in search of immortality. Neither Mesopotamian tradition nor the Bible suggest that the generations before the flood possessed immortality—only unusual longevity. Consider now the location of the plant. Its whereabouts are known only to Utnapishtim, since he, by virtue of surviving the flood, is acquainted with antediluvian terrain. Why is the plant inaccessible to mankind in the postdiluvian era? It is found in the most remote region of the earth—Paradise. As though that were not enough, it is growing deep beneath the water. Are these the waters of the great flood? Certainly, since Utnapishtim, who remembers the earth before the flood waters came, is the only one who can tell us where to dive for the plant. What more powerful symbol of the flood than a doubly forbidding barrier between postdiluvian man and his more durable forbear? This plant, this hope for longer life, is not only as remote as Paradise, but is buried deep beneath the waters of the deluge!

So the skeleton of the myth becomes clear: The antediluvian kings, perhaps all men, had access to the plant of rejuvenation before the gods concealed it under the waters of the flood. These waters which separated the long-lived and short-lived kings of the Sumerian King List also separate postdiluvian society from the secret of rejuvenation, the miraculous plant. Furthermore, the myth also points out that ancient man, not unlike ourselves, raised questions about this longevity. What has long puzzled modern theologians and students of the Bible was similarly perplexing to the ancients and gave rise to this etiological myth.

While literary analysis has taken us about as far as we can reasonably expect in reconstructing the tale of the magic plant, we might ask what sort of world-views were held in ancient Mesopo-

Hand copy of a cuneiform tablet of the Gilgamesh Epic (Tablet XI: lines 278-82). Translation: "Urshanabi, this is a plant apart, whereby a man may regain his life's breath .... Its name shall be 'Man Becomes Young in Old Age.' "



tamia which would provide a background for our story. The motif of a rejuvenating plant as well as that of watery deeps suggests immediately the domain of the wise and beneficent Ea. This deity (known in Sumerian as 'Enki') is well known as the "Lord of the Apsû," i.e., the sweet waters beneath the earth which feed springs and rivers (Jacobsen 1976: 111). He was the patron deity of the ancient city Eridu, where he was worshipped as the benevolent fish-god. Even more common are the references to Ea as the benefactor of all mankind who is the "Lord of Wisdom." Since all the secrets of heaven and earth are his, he and his son Marduk are masters of the priests whose task is to perform exorcisms and other magical-medicinal rituals (Oppenheim 1964: 195; Saggs 1962: 292-95; Römer 1969: 129). In the Atrahasis Epic, Ea helped mankind survive the wicked plan of the gods to send plague, drought, and flood upon the earth. Again in the Gilgamesh Epic, it was Ea who took pity upon humans, warning Utnapishtim to build an ark to escape the deluge. So Ea, who knows magic and incantations, is also predisposed to help human beings who are in desperate need.

His connection with the regions under the earth also prompts us to mention his interest in plants. In the myth of Enki and Ninhursaga, Lord Ea is the creator and sustainer of all primal plants (Jacobsen 1976: 112-13; Kramer 1969a: 37-41). In the story of Inanna's descent to the netherworld we read (Kramer 1969b: 54, ll. 65-67):

> Father Enki, the lord of *wisdom*,
> Who knows the Plant of life,[2]
> Who knows the water of life,
> *He will surely bring me to life.*

There is an Assyrian incantation which states: "After Anu had begotten the heavens and Ea had established the plants in the world below . . . " (Lambert and Millard 1969: 166-67). From this we learn that not only does Ea create plants, but he nurtures them in his marine world beneath the earth. The Atrahasis story contains a similar notion. After Enlil made the decision to destroy mankind, he posted guards over all the critical regions of the universe to make certain that no one would help the ill-fated earthlings. He decreed that Anu would guard the upper regions of heaven, that Sin and Nergal would be posted in Middle Earth, and that Ea would guard "the bolt, the bar of the Sea, together with his plants" in the subterranean waters (Lambert and Millard 1969: 117, 166-67). How could these plants have survived the poisonous salt waters of the evil sea? An ancient cosmological myth, the Eridu Creation Story, provides the answer (Heidel 1942: 62, ll. 1-13). It says that before creation, there was no earth, no cities, not even the *apsû* existed. There was only Tiamat, the salt water deep. At that time a certain god made a fresh-water spring which was simply a fresh-water "pipeline" (*rāṭu*) into the salt sea; then he made the *apsû* and situated Eridu upon it. It has been suggested that this "pipeline" nourished and sustained Ea's plants of the deep (Speiser 1969: 96, n. 232). If that is the case, it certainly provides an explanation for a similar notion in the story of "Gilgamesh and the Magic Plant." When Gilgamesh went in search of the plant we are told that "he opened the water-pipe (*rāṭu*)" and descended to the *apsû*, the sweet waters, Ea's abode (XI: 271-73). Perhaps this connection between Gilgamesh's descent and the water-pipe of the deep is further alluded to in the incipit to the Epic: *ša nagba īmuru* "he who has seen the abyss," or the *apsû* where Ea guards his plants.

Ea's son Marduk, often mentioned in texts dealing with exorcism and medicine, is frequently called by the name of Asalluhi. One such text reads: "May Asalluhi, patron god of exorcism, absolve you by means of the plants of the mountains and the plants of the deep" (Biggs 1967: 17:15). And in a similar passage (Craig 1895: 59, ll. 1-5):

An Akkadian cylinder seal impression showing the god of life-giving waters, Ea. Courtesy of Frederick A. Praeger.

An Akkadian cylinder seal impression showing Gilgamesh wrestling with a lion. In the center a triple plant and at the right a dedicatory inscription naming the son of Abilum, a scribe. Courtesy of Batchworth Press.

Asalluhi, the exorcist of the gods,
Marduk, the holy god, exorcist of the gods,
King of the *apsû*, whose incantation means life,
Asalluhi, exorcist of the gods, who brings the dead to life,
[Giver of] the plant of life, who purifies heaven and earth . . . .

Note further Ea's instructions to Marduk regarding a ritual and incantation against bewitchment: "Go, my son Marduk! Give him your pure drink of life, let him eat the plant of life" (Saggs 1962: 304). Thus Ea, so willing to aid the antediluvians, and his son Marduk know the mysteries of the deep as well as the cultivation and use of magic plants.

It has now become clear that the story of "Gilgamesh and the Magic Plant" was once a separate and independent tale. Its central figure Gilgamesh, the survivor of the flood, as well as the elements of a magic plant and waters of the deluge, have led us to the inescapable conclusion that the story in its original form was a myth accounting for the belief in antediluvian longevity. Furthermore, the mythological world-views of the ancient Near East, culled from a variety of sources, provide the original story with a comfortable environment. "Gilgamesh and the Magic Plant" is indeed at home in the thought-world of ancient Mesopotamia.

Of course, most interest in the antediluvians stems from the stories in the early chapters of Genesis. For more than 100 years, scholars have been tantalized by the many parallels in Mesopotamian literature to the prehistoric motifs of the Bible. The idea that the Genesis flood narratives are based on Babylonian forerunners is not without controversy. However, the close literary parallels between the so-called "J" flood story and Gilgamesh XI cannot be brushed aside. It is very difficult to imagine that the episode of the birds (Gen 8:6-12) is not based on the very similar story in Tablet XI: 145-54 (Lambert 1965: 291-92; Heidel 1946: 224-69). Furthermore, the behavior of Yahweh at the sacrifice in Gen 8:20-21 is astonishingly similar in tone to the very gross story of the gods who, having repented of their evil plan, are "crowding like flies about the sacrificer" (XI: 155-61). Obviously, the Yahwist has in mind a monotheistic revision of the Babylonian tradition. One must demonstrate that God would not act irrationally in bringing about the deluge. The blame must be placed upon sinful mankind who is indeed deserving of punishment. Notice that the biblical narrative totally ignores the deceitful plan of the god Ea to lie to the citizens of Shurrupak about the impending disaster (XI: 32-47). Biblical justice demands that humans, while deserving punishment, should not be deceived by Yahweh. Further offence is avoided by a slight change in the door-closing episode. In XI: 94-95, Puzur-Amurri battens down the hatches of the ark only to remain behind, short-term heir to the palace of the city.[3] In order to remove the moral problem brought forward by the necessity of someone's remaining outside the craft after having participated in the project, Yahweh himself closes the door to Noah's ark (Gen 7:16b). The closing of a door is too small and insignificant a detail for two authors to include independently. Gen 7:16b is a moral comment on Gilgamesh XI: 94-95. However, it is not appropriate to say more about such matters here. What can be learned from literary comparisons of biblical and Babylonian flood traditions has been most ably set forth by T. Frymer-Kensky (1977).

The puzzling fact remains that the Bible does not offer us an explanation for the long-lived generations before the flood. Even extrabiblical Jewish legends leave us wondering. Rabbinic traditions abound regarding the durability of the generations before the deluge. It is said thay they suffered neither pain nor disease, that they knew neither toil nor care because, by means of magic, they made sure that the yield of one harvest would be sufficient for forty years. They gave birth after a few day's pregnancy and their offspring walked and talked immediately.

There are some allusions as well to magic plants. The book of Enoch, commenting upon the encounter between human and divine beings in Gen 6:1-4, says that the humans were taught the arts and crafts of civilization, including the efficacy of plants. However, this story intends nothing more than to account for the origin of human medical knowledge.

Another legend informs us that shortly before his demise Adam took sick (an event whose uniqueness caused all manner of curiosity among his contemporaries) and wished desperately to be healed. He sent Eve and Seth to Paradise to procure for him the oil of life which flows from the tree of mercy. At the gates of the garden, Michael refused their request, informing them that only at the time of the resurrection will the pious receive the benefits of such anointing. (For the rabbinic material mentioned above, see Ginzburg 1909: 93-94; 153-74.)

None of these traditions has demonstrated features of an etiological

Snake eating a plant. Courtesy of B. A. Bowles.

They was two fellas a'goin' along one time in th' woods, an' saw two snakes a'tangled up fightin'. They just stopped an' watched 'em. It was a big black snake and a rattlesnake. Th' black snake'd work all th' time t'get wrapped around an' get up next t'his neck'n'head, y'know. Rattlesnake, he'd keep bitin'im an' pushin'im back.

An' said directly that black snake just quit an' wheeled an'run. Said, "I reckon th'fight's over." It wadn't though, fer here he come back, an' they hooked up fer a fight again. An' said directly th' rattlesnake pecked'im again, an' he fit just a little mores with'im and took off in th' same direction he did in th' first.

So when he come back an' they went t'fightin', why, he bit'im again. And while they's doin' th'fightin', way I always heered it, one a'these men follered th' black snake. An' there was a kind'a a bunch a weeds a'standin' there, an' that black snake went out a lookin' about an' directly he see'd it an' made a run fer' it and grabbed off some'a it an'eat it, and back he went fer his fight.

An' that man reached down there an' just pulled that up an' had it in his hand? An' th' next time that black snake went back fer his weed, he couldn't find it since th' man had pulled it up. He hunted an' hunted around there an' couldn't find any like it, an' directly he sorta keeled over on his side, an' in a few minutes he'uz dead.

Never knowed what weed it was, but looks suspicious like it might work fer humans.

myth of antediluvian longevity. It appears that we possess no tradition, biblical or otherwise, which indicates ancient Hebrew knowledge of an etiological story similar to our plant myth. "Gilgamesh and the Magic Plant" stands alone as literary evidence that the ancients too required an explanation for the tradition of antediluvian longevity.[4]

The Snake

Within the narratives of the plant myth there is a short but fascinating myth about the snake. Gilgamesh XI: 287-89 provides a story which answers the question: "Why does the serpent shed his skin?" i.e., why should the snake receive rejuvenation rather than mankind? The answer is clear: the serpent has the ability to identify magic plants by sniffing their fragrance. The same story is told in the ancient Greek tale, "The Resurrection of Glaucus" (Frazer 1921, vol. I: 301-13). According to Apollodorus, there was a certain Polyidus of Argos who, while visiting the isle of Crete, was selected from a group of diviners to make a search for the lost lad Glaucus. It was soon discovered that the boy had fallen headlong into a jar of honey and was drowned. His father, insisting that Polyidus should have found the lad alive, shut the poor traveler in the tomb with the body of Glaucus. While contemplating his predicament, Polyidus observed a snake slithering slowly toward the corpse. Seizing a stone, he threw it and killed the viper, insuring that no worse fate would befall him. A second serpent appeared, spied its dead mate, and left only to return with a herb. No sooner had the serpent placed the plant upon the dead snake than it came to life. Polyidus had the presence of mind to press the same plant to the body of Glaucus with the result that the lad was restored to life.

The motif of the serpent's gift is very common in world literature. Tales nearly identical to this one can be found in the folk literature of Germany, Lithuania, Russia, Turkey, Poland, Italy, and Armenia (Frazer 1921, vol. II: 363-70). Somehow the same tale has come to the soil of the United States. Here is one version which is typical of the Appalachian culture (Wiggington 1972: 299-300):

Every semester when teaching the Gilgamesh Epic, I recount a version of the Appalachian story. Invariably a student will volunteer, "That's right! It happened to my gran'daddy just like that!" Although students frequently have great difficulty accepting the Near Eastern myths as meaningful in any sense, when the same story is placed in their cultural milieu, with only slightly different dress, and the informant claims to know the one to whom this happened, it makes all the difference in the world.

Notes

[1]See Thompson 1930, pls. 51 and 52. Notice that of the several tablets containing this portion of the epic, only one (K3375) omits the dividers.

[2]For the phrase *ú.nam.tì.la* we translate: "Plant of Life." See also Oppenheim 1964: 263.

[3]Translating ll. 94-95: "For (his) final caulking of the ship, I gave the palace along with its contents to Puzur-Amurri, the boatwright."

[4]Josephus (Thackeray 1930: sections 105-6) speaks briefly to the issue suggesting somewhat "scientifically" that their diet was conducive to longevity. Moreover, he suggests, it was necessary for them to live through at least one complete "great year" (some sort of greater planetary cycle requiring from 350-700 years) in order to learn astronomy. However, one can scarcely refer to Josephus' comments as "an ancient etiological myth."

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THE GARDEN OF PHOEBUS.

In two recent articles I sought to show that the Latin poets of the first century B. C. did not consider Apollo a sun-god and that as yet the linking of Apollo with Helius was confined to special groups, such as the Stoics.[1] But error dies hard; and I find it necessary to supplement those articles with a short discussion of a special problem.

In his book *The Gates of Dreams* E. L. Highbarger has much to say about a garden of Phoebus at the eastern end of the world where the sun rises.[2] It was the same as Elysium, the meadow of asphodel, the islands of the blessed, Mount Olympus, and heaven. It was on the Ocean Stream and was the counterpart of the garden of the Hesperides in the west. There Phoebus Apollo, as god of the sun, had his palace. There was the gate of the Sun or gate of Day whence the Sun's chariot issued to light the world. Furthermore this eastern gate, at the junction of earth, heaven, and the lower world, was Homer's ivory gate, the gate of false dreams. Highbarger finds the roots of this concept of a garden of Phoebus in Homer and Hesiod; but it becomes full-blown, he says, in writers of the sixth and fifth centuries, Stesichorus, Sophocles, and Euripides; and Virgil's Elysium (*Aen.*, VI, 637-899) is the garden of Phoebus in its most complete imaginative development.[3]

The entire argument is complex and elaborate, and to support it Highbarger weaves together evidence from many sources. I am not concerned here with his theory of the gates of dreams but only with the garden of Phoebus, which, one gathers from his book, was a commonplace of the ancient imagination from the sixth to first centuries. If he is right, then Apollo was more commonly considered a sun-god in sixth and fifth century Greece than has recently been supposed, and there is little distinction in Virgil and his contemporaries between Apollo and Sol. For

[1] "Apollo and Sol in the Latin Poets of the First Century B. C.," *T. A. P. A.*, LXX (1939), pp. 439-55; "Apollo and the Sun-God in Ovid," *A. J. P.*, LXI (1940), pp. 429-44.

[2] Ernest Leslie Highbarger, *The Gates of Dreams* (Baltimore, Johns Hopkins Press, 1940).

[3] *Ibid.*, pp. 56-58, 99-107.

Highbarger's Phoebus is Apollo and he is a sun-god.[4] It is necessary, therefore, to look at all the evidence upon which Highbarger bases his concept of a garden of Phoebus. This, in fact, comes to no more than five passages:

1) Stesichorus, frag. 6 Diehl, *ap.* Athenaeus, XI, 38, p. 469 (*Oxford Book of Greek Verse,* 161):

> Ἀέλιος δ' Ὑπεριονίδας δέπας ἐσκατέβαινεν
> χρύσεον ὄφρα δι' Ὠκεανοῖο περάσας
> ἀφίκοιθ' ἱερᾶς ποτὶ βένθεα νυκτὸς ἐρεμνᾶς
> ποτὶ ματέρα κουριδίαν τ' ἄλοχον παῖδάς τε φίλους·
> ὁ δ' ἐς ἄλσος ἔβα
> δάφναισι κατάσκιον ποσσὶ πάις Διός.

These lines are quoted by Athenaeus to illustrate the cup that Helius uses as a boat on the Ocean Stream. They are obviously part of a longer poem. The ὁ δέ is about proof enough that the πάις Διός of line 6 is not the Helius of line 1. But Highbarger identifies them, assuming that the son of Zeus is Apollo and that Apollo is the sun.[5] If the son of Zeus is Apollo, and the

[4] *Ibid.,* p. 57: "... by the sixth century B. C., this Garden had become associated with Phoebus or Apollo, and was now thought to be located in the East, where the Sun rises." *Ibid.,* p. 58: "The 'Gate of the East' was vastly different. It was located in the region of bright day, where the Garden of Apollo was to be found." In my articles cited in note 1 *supra* I showed that the Latin poets used Phoebus as a name of Sol without thereby identifying him with Apollo; but the name *Apollo* and almost all other names and epithets of Apollo were never applied by them to the sun-god.

[5] But he is not entirely clear about this. Such an identification seems implicit in his discussion on pp. 56 f. But on p. 53 he says, "He tells us how Helios once sailed in his *golden* cup over Ocean to the depths of Night, there to join his mother, wife, and children; but Apollo withdrew to the deep shade of his sacred grove of laurel." Here ὁ δέ is interpreted correctly. See H. W. Smyth, *A Greek Grammar for Colleges* (New York, etc., American Book Co., 1920), § 1112.

In passing I might point out that Highbarger misinterprets the first four lines. He says that Helius *once* sailed in his cup and that he sailed to the depths of night. But the idea is the same as that found in Mimnermus, frag. 10 Diehl (*Oxford Book of Greek Verse,* 120): when Helius reaches his western goal he must get into his boat (which is sometimes represented as a cup) and be carried back, while he sleeps, to his eastern palace, so that he can start the new day. Again Highbarger seems to vary in his interpretation; on the very next page (54), where he speaks of Mimnermus' poem, he seems to have the correct interpretation.

mention of a grove of laurel is a reason for supposing so, then we have a passage that is like several in Homer, where the rising or setting of Helius is fancifully expressed in a sentence of one or more verses to mark the time when the action of the following sentence took place.[6] But it is more likely that C. M. Bowra is right in supposing that Heracles is meant and that Stesichorus tells how he reached the west by sailing in the sun's cup on the Ocean Stream.[7]

2) Sophocles, frag. 870 Nauck, *ap.* Strabo, VII, 3, 1, p. 295. It is desirable that I also quote Strabo's surrounding text; he is discussing Germany:

διὰ δὲ τὴν ἄγνοιαν τῶν τόπων τούτων οἱ τὰ Ῥιπαῖα ὄρη καὶ τοὺς Ὑπερβορείους μυθοποιοῦντες λόγου ἠξιῶνται . . . ἐκεῖνοι μὲν οὖν ἐάσθωσαν· οὐδὲ γὰρ εἴ τινα Σοφοκλῆς τραγῳδεῖ περὶ τῆς Ὠρειθυίας λέγων ὡς ἀναρπαγεῖσα ὑπὸ Βορέου κομισθείη

ὑπέρ τε πόντον πάντ' ἐπ' ἔσχατα χθονὸς
νυκτός τε πηγὰς οὐρανοῦ τ' ἀναπτυχὰς
Φοίβου τε παλαιὸν κῆπον,

οὐδὲν ἂν εἴη πρὸς τὰ νῦν, ἀλλ' ἐατέον . . . .

This is the only passage cited by Highbarger in which such a phrase as Φοίβου κῆπος occurs. But, if the three verses are read by themselves, they appear to prove his concept. They mention the ends of the earth, the springs of night, the regions where the canopy of the sky, so to speak, unfolds; and here is the garden of Phoebus, who to Sophocles must be Apollo.

The context of this quotation in Strabo's *Geography* shows, however, that the ἔσχατα χθονός are the land of the Hyperboreans and that Sophocles is telling the story of how Boreas carried off Oreithyia. The ancients almost unanimously placed the Hyperboreans in the farthest north, interpreting their name as "dwellers beyond the north wind."[8] It is true that this etymology is disputed by Farnell and others.[9] But, whatever the

[6] See *Il.*, II, 48-51, VII, 421-23; VIII, 1-3; XI, 1-4; *Od.*, II, 388 f.; III, 1-5.

[7] C. M. Bowra, *Greek Lyric Poetry* (Oxford, Clarendon Press, 1936), pp. 86-88.

[8] See Pindar, *Ol.*, 3, 31; Callimachus, *Hymn* 4, 281 f.; Diodorus Siculus, II, 47, 1; Pausanias, V, 7, 7.

[9] L. R. Farnell, *The Cults of the Greek States*, IV (Oxford, Clarendon Press, 1907), pp. 99-111; O. Crusius, *s. v.* "Hyperboreer," *Myth. Lex.*,

truth of their interpretation, there is no denying that most ancient writers who mention the Hyperboreans give them a northern home.[10] There were a few, however, who placed the Hyperboreans in the same region as the Hesperides and Atlas; [11] this seems to show a tendency to link the north and west, just as the south and east were linked in ancient concepts of the Aethiopian land.

In νυκτός τε πηγὰς οὐρανοῦ τ' ἀναπτυχάς we seem at first glance to have phrases more appropriate to east and west than to the far north. But the first phrase is, I am sure, an allusion to the polar night. The second phrase is an allusion to the hinges of the world, in this case the north pole. The whole verse is made clear by passages in Pomponius Mela and Pliny the Elder.[12] I quote Pliny:

Pone eos montes ultraque Aquilonem gens felix, si credimus, quos Hyperboreos appellavere, annoso degit aevo, fabulosis celebrata miraculis. ibi creduntur esse cardines mundi extremique siderum ambitus semenstri luce solis adversi . . . semel in anno solstitio oriuntur iis soles brumaque semel occidunt.[13]

If νυκτὸς πηγαί did have reference to the sun's daily course, it

I, 2829-31; H. J. Rose, *A Handbook of Greek Mythology* (London, Methuen, 1928), pp. 135 f. But see Joseph Wells, *A Commentary on Herodotus*, I (Oxford, Clarendon Press, 1912), pp. 313 f., on Herodotus, IV, 32-36.

[10] *Homeric Hymn* 7, 28 f. and Pindar, *Isthm.*, 5 (6), 23 make the Hyperboreans the antithesis of Egypt or of the Nile's source, i. e. of the far south. On the northern home of the Hyperboreans see Herodotus, IV, 13, 32 f. and 36; Pherenicus, *ap.* Schol. Pind. *Olymp.*, 3, 16 (28); Mela, III, 5, 36; Pliny, *N. H.*, IV, 89.

[11] See Apollodorus, II, 5, 11.

[12] *Locc. citt.* in note 10 *supra.* Herodotus, IV, 25, 1 speaks of the six months' sleep of the people who lived in the unknown regions of farthest Scythia; and Joseph Wells, *op. cit.* (see note 9 *supra*), p. 311, is undoubtedly right in supposing this to be a confused tradition of the long polar night. Herodotus, IV, 31 mentions the heavy snowfall of the Scythian winter, which may have strengthened the tradition of Hyperborean night. The friendship of Sophocles and Herodotus and Sophocles' debt to Herodotus for geographical lore are well known.

[13] See Mela, III, 5, 36: in Asiatico litore primi Hyperborei super Aquilonem Riphaeosque montes sub ipso siderum cardine jacent, ubi sol non cotidie ut nobis, sed primum verno aequinoctio exortus autumnali demum occidit; ideo sex mensibus dies et totidem aliis nox usque continuata est.

would more naturally mean the west, not the east; so that, even if we attach importance to the rare evidence that connects the Hyperboreans with the Hesperides, we are far from having an eastern garden of Phoebus.

Furthermore Sophocles is telling us that Boreas, the north wind, carried Oreithyia to the ends of the earth, which would obviously mean his own northern home. In the usual tradition he takes her to Thrace,[14] which meant much the same thing to the earliest Greeks as Scythia meant to later Greeks; that is, it meant the regions of the north, a land of strange peoples.[15]

Now the Hyperborean land could properly be called *Φοίβου κῆπος* by Sophocles. It was a land that Apollo favored very much. All the Hyperborean people were virtually priests of Apollo, ever worshipping him and singing hymns in his honor. And they were often represented as living in a sort of paradise, in a pleasant land on the Ocean Stream, north of the northern cold.[16]

3) Sophocles, frag. 297 Nauck, *ap.* Stobaeus, *Flor.*, 103, 10:

ἐν Διὸς κήποις ἀροῦσθαι μόνον εὐδαίμονας (or *εὐδαίμονος*) *ὄλβους.*

Of this Highbarger (p. 57) says, "The more general conception of the 'Garden of the Gods' is also found," and adds in a note (30), "specifically of Zeus." Stobaeus quotes this verse in his chapter entitled Περὶ εὐδαιμονίας. It is simply a proverb, a *γνώμη*. The text is uncertain, but its meaning seems to be: only the

[14] See Apollonius Rhodius, *Arg.*, I, 211-18; Schol. on Apoll. Rhod. *Arg.*, I, 211; Ovid, *Met.*, VI, 682-713. See Eva Frank, *s. v.* "Oreithyia," *R.-E.*, XVIII, cols. 954 f.

[15] H. L. Jones, in his edition of Strabo, III (London and New York, *L. C. L.*, 1924), notes on pp. 174 f., believes that Sophocles' verses refer to all four directions; the second line, then, would mean west and east, and the garden of Phoebus would be the south. He supposes that Boreas carried Oreithyia off to all *ἔσχατα χθονός* before settling down with her in the north. But there is no evidence, nor is it likely, that Boreas took Oreithyia in any direction but northwards.

[16] On Apollo's relation to the Hyperboreans and the nature of their land see Alcaeus, frag. 2 Bergk, *ap.* Himerius, *Or.*, 14, 10; Bacchylides, 3, 58-60; Herodotus, IV, 33-35; Hecataeus of Abdera, frag. 4 Mueller (*F. H. G.*, II, 387), *ap.* Aelian, *H. A.*, XI, 1; Diodorus Siculus, II, 47, 2 f. and 6; Apollonius Rhodius, *Arg.*, II, 674 f., IV, 612-14; Pherenicus, *loc. cit.* (see note 10 *supra*). See Daebritz, *s. v.* "Hyperboreer." *R.-E.*, IX, cols. 261-67.

fortunate cultivate the gardens of Zeus.[17] It has nothing whatever to do with east or west, north or south.

4) Euripides, *Phaethon,* frag. 771 Nauck and frag. 773 Nauck, 15-18. In these verses Highbarger says that the concept of the garden of Phoebus "composed of dark laurel"[18] becomes wholly explicit. I find in them, however, only Ἡλίου δόμους and φαεννὰς Ἡλίου ἱπποστάσεις. Highbarger has no difficulty in proving that these were located by Euripides in the far east. There is no mention of a garden.

5) Virgil, *Aeneid,* VI, 637-899. This is Virgil's description of Elysium, which, says Highbarger (p. 101), "is clearly the 'Garden of Phoebus'." He also says (p. 103), ". . . he (Virgil) could best symbolize it by the 'Grove of Phoebus,' which in myth was located in the East, by the Gate of the Sun. But Elysium was also heaven and therefore located in the sky." "For these reasons it seems proper to speak . . . of his Elysium as the 'Garden of Phoebus'" (p. 104). "Since in Vergil's own words Elysium is the realm of the sun and Apollo . . ." (p. 106), ". . . the sun was the bright luminary of Elysium and was associated with Apollo . . ." (p. 107). How is Highbarger so certain that Elysium was the realm of Apollo? He relies upon verses 656-665, where, he says, "The noble company of Phoebus is described":

conspicit ecce alios dextra laevaque per herbam
vescentis laetumque choro paeana canentis
inter odoratum lauri nemus, unde superne
plurimus Eridani per silvam volvitur amnis.
hic manus ob patriam pugnando volnera passi,
quique sacerdotes casti, dum vita manebat,
quique pii vates et Phoebo digna locuti,
inventas aut qui vitam excoluere per artis,
quique sui memores aliquos fecere merendo:
omnibus his nivea cinguntur tempora vitta.

But Virgil is saying that Aeneas and the Sibyl have come to the company of the blessed, men who were heroes and benefactors upon earth. The group (*manus*) is made up of great warriors,

[17] See the conjecture quoted by Nauck: ἐν Διὸς κήποις ἀροῦσι μοῦνον ἄνδρες ὄλβιοι.

[18] Apparently a translation of Stesichorus' words ἄλσος δάφναισι κατάσκιον.

priests, bards and prophets (*vates*), artists and inventors (663), and philanthropists (664). Only of the *vates* does Virgil say *Phoebo digna locuti*, which must mean that what they had spoken and sung in life was worthy of Phoebus Apollo; whether we take *vates* as bards or as prophets or as both, their patron was Apollo. These words do not justify anyone in calling the whole group a company of Phoebus.

Highbarger also points to *lauri nemus* in 658. The laurel was especially sacred to Apollo, but it was also closely connected with the spirits of the dead and Hecate.[19] For that reason the laurel is a fitting tree for a grove in Elysium. Again, the blessed are singing a joyful paean, and the paean was in origin a song in honor of Apollo. But Virgil is obviously alluding to the Homeric custom of singing the paean after a feast; [20] for the blessed have been feasting.[21] In any case a laurel grove and a paean are slender support for calling Elysium a garden of Phoebus.[22]

And why is Highbarger so certain that Elysium is the realm of the Sun? His sole support must be verse 641: *solemque suum, sua sidera norunt.* But he has ignored *suum* and *sua* (see p. 101). Obviously Virgil is saying that the blessed in Elysium have their own sun and their own stars, which are not the sun and stars of earth.[23] And Virgil makes it plain enough that Elysium is in the lower world and not in the sky. See *superne*

[19] See M. B. Ogle, "Laurel in Ancient Religion and Folklore," *A. J. P.*, XXXI (1910), pp. 287-311, an article that is cited by Highbarger on p. 101, n. 140.

[20] See *Il.*, I, 473, καλὸν ἀείδοντες παιήονα, with which compare *laetum paeana canentis*.

[21] Highbarger says (p. 102), "Food . . . is not mentioned here . . . ." But what does *vescentis* mean in 657?

[22] I might add that Orpheus, son and bard of Apollo, is present (645-47). But where would Orpheus be, if not in Elysium? There is no evidence anywhere that Apollo, or Helius either, was especially concerned with the Elysian fields; see Waser, *s. v.* "Elysion," *R.-E.*, V, cols. 2470-76.

[23] Highbarger also makes a mistake in assigning Orcus to the moon. He says, "This dark region was said to be illumined by the faint light of the moon, which was closely associated with Hecate and Diana." He cites *Aen.*, VI, 268-72 and 451-54. But in these passages the light of the underworld is compared to the light of a partly obscured moon. Highbarger himself on p. 99 recognizes that these passages are similes.

in verse 658 of the quotation above, and *ad caelum hinc ire* in 719, where *hinc* must refer to the place where Aeneas and Anchises are.[24]

This review of the evidence on which Highbarger supports his view shows that the ancients had no established tradition of a special Garden of Phoebus in the east or anywhere else. The term occurs but once as a poetic designation of the Hyperborean land.

JOSEPH FONTENROSE.

UNIVERSITY OF CALIFORNIA, BERKELEY.

[24] See also VI, 750: *supera ut convexa revisant.* According to Highbarger, Aeneas and the Sibyl leave Elysium by the ivory gate (VI, 898) because it is the eastern gate of the Sun, and Elysium, which is in the sky, is his garden in the east. This can no longer be maintained, once his ideas about Virgil's Elysium are proved unsound. I am sure that Norden, Mackail, and other commentators are right in supposing that Aeneas leaves by the ivory gate because he leaves before midnight, probably at sunset or just after; and it is the ivory gate that is open before midnight; Horace, *Sat.*, I, 10, 33. This is not far-fetched, as H. E. Butler says; it is a very clever touch. It is absurd to suppose, as Highbarger does (p. 95 with n. 116), that Aeneas stayed twenty-four hours in Orcus and Elysium. His argument rests upon a misinterpretation of *tendit sub umbras* in VI, 578 and an assumption that Aeneas went all the way down to Tartarus. Any further discussion of the problems of *Aeneid* VI lies beyond the province of this paper. Whatever Virgil's Elysium may be, it is not a garden of Phoebus.

THE FRAGRANCE OF BIBLICAL MANDRAKE[1]

ALEXANDER FLEISHER AND ZHENIA FLEISHER

Fleisher, Alexander *(Florasynth, Inc., 300 North Street, Teterboro, NJ 07608 USA) and* **Zhenia Fleisher** *(Crompton & Knowles Corp., 1959 MacArthur Boulevard, Mahwah, NJ 07430 USA).* THE FRAGRANCE OF BIBLICAL MANDRAKE. *Economic Botany 48(3):243–251. 1994. Mandrake (*Mandragora officinarum*), nearly forgotten today, is one of the most famous plants known to humanity. For thousands of years, this plant was revered by many cultures, which ascribed to it mysterious and demonic qualities. Mandrake is mentioned in the Bible (Gen. 30:14–16) and its Biblical use is generally attributed to its supposed fertility power. A detailed study of Pentateuch text and the various commentaries allowed us to re-evaluate the role of mandrake in Biblical events. Sufficient evidence was found to conclude that the appearance of this plant on the Biblical scene is not due, as was commonly believed, to alleged magic power of its root, but to the unique fragrance furnished by the fruits of mandrake. It seems that the Scripture clearly connects the fragrance of mandrake with sexuality, which is the only known account of direct link between odor and human sexual response. Fifty-five principle odoriferous constituents were identified in rather bizarre chemical composition of mandrake aroma. It will be of assistance for a suggested scientific study of potential aphrodisiac effect of mandrake fragrance.*

АРОМАТ БИБЛЕЙСКОЙ МАНДРАГОРЫ. *Почти забытая ныне мандрагора,* Mandragora officinarum *L., является одним из наиболее удивительных растений известных человечеству. Народы разных стран и культур тысячелетиями преклонялись перед этим растением, считая его приворотным зельем и веря в его таинственные колдовские свойства. Принято считать, что упоминание мандрагоры в Книге Бытия 30:14-16 объясняется приписываемой ей с древности способностью благоприятствовать зачатию. Пристальный анализ текста Пятикнижья и изучение мнений различных его толкователей позволили нам коренным образом изменить традиционный взгляд на роль мандрагоры в Библейских событиях. Наша новая трактовка позволяет утверждать что появление мандрагоры на Библейской сцене объясняется не "магическими" свойствами её корня, а уникальным запахом, присущим её плодам. Результаты данной работы свидетельствуют о том, что Священное писание непосредственно связывает аромат мандрагоры с любострастием. Это является единственным доныне известным указанием прямого влияния запаха на половое возбуждение. В весьма странном химическом составе летучей фракции плодов мандрагоры, которая определяет её запах, идентифицированы пятьдесят пять компонентов. Это обстоятельство может быть использовано в дальнейшем научном исследовании возможного возбуждающего эффекта аромата мандрагоры.*

Key Words: Mandrake, *Mandragora officinarum*; Biblical flora; fragrance, aphrodisiac effect.

On the rolling hills of Judea and the abandoned terraces of Galilee in the early spring grows a low plant with elongated leaves surrounding a crown of purple flowers. This is *Mandragora officinarum* L., known in English as mandrake. Looking at this humble plant, which hides under much more impressive vegetation, it is hard to imagine the mystery, intensity of emotion, and vastness of written material that has surrounded mandrake for the past 4000 years.

Marvelous and fearful stories about a strange, human shaped root with celestial powers over human life were passed down from generation to generation. People believed that it could cure the sick, exorcise demons, and bring riches to its

[1] Received 17 June 1993; accepted 1 February 1994.

owner. Ancient Greek and Roman philosophers, whose views combined deep superstition and common-sense materialism did not deny the supernatural powers of mandrake, but valued it primarily for its medicinal properties. Hippocrates, Pliney the Elder, Dioscorides, and many others described the intoxicating and narcotic qualities of the root. In fact, it was the first known anesthetic. But the true source of the glory and worship of mandrake was its alleged ability to induce, sustain, and sharpen the passion of love. Its root was considered a potent philter. Pliny in *Natural History* and Discorides in *De Materia Medica* wrote that some called mandrake "Circaeon," after Circe, the mythical sorceress who turned men into sexually supercharged swine (Harris 1917).

Belief in miraculous power of mandrake is very ancient indeed.

In his famous book *The Guide for the Perplexed* (Dalalat al-Hairen), written around 1190, Maimonides gave detailed accounts of the religious and worship practices of the Sabeans, among whom the Patriarch Abraham was brought up.

Citing the Sabean religious book *On Nabatean Agriculture,* which in turn refers to an alleged book written by Adam, Maimonides (1956) described Sabean belief in magic qualities of mandrake and considers it among "great absurdities which are ridiculous in the eyes of intelligent people."

In his unique study *The Origin of the Cult of Aphrodite,* J. R. Harris (1917) concluded that the Greeks collected bits and pieces of fact and superstition about mandrake, developed over millennia by the peoples of the Mediterranean. Mythologically organized and aesthetically shaped, these gave rise to one of the most exquisite creations of the classical Mediterranean world: the goddess of Beauty and Love, Aphrodite (Harris 1917).

It was always difficult to gain possession of mandrake root. Gathering it was considered mortally dangerous. The only way to avoid certain death was to tie a rope around a dog's neck, attach it to the plant, and let him pull the root from the ground. Soon afterward the dog would die in his owner's stead.[a] Theophrastus and Pliny advised their readers to trace three circles around the plant with a sword and to dig it up while facing west and loudly screaming sexual verses (Harris 1917).

Nothing fundamentally new was added to the ideas about mandrake for the next 1500 years. The root was still a highly celebrated love charm and aphrodisiac in Medieval Europe, known as mandrake in England, der Alraun in Germany and Main de gloire in France. By that time its alleged magical powers and honored place in occult philosophy far outstripped its now diminished medicinal values.

The gathering of the root, however, had become a nightmare. It was now believed that the mandrake root owed its human shape to sperm emitted by a hanged man during asphyxiation. It therefore grew under the gallows and had to be collected at midnight; and if this was not terrifying enough, imagine the gatherer's fears as he trembled in anticipation of terrible "shrieks of mandrake torn out of earth, that living mortals, hearing them, run mad" (W. Shakespeare, *Romeo and Juliet*). There was an additional fear; being seen in search of mandrake or actually possessing its root was sufficient evidence for trial, conviction, and execution for witchcraft, a fate that befell three women in Hamburg in 1630. It is hardly surprising that the price of the root was extremely high, and since the plant does not really grow under gallows at all, and in fact is not even native to Western Europe, the business of adulteration was booming (Harris 1917; Thompson 1934).

All of the above information is well documented, and the interested reader will find a great many other facts and details in reputable manuscripts and reviews on the subject (Emboden 1979; Folkard 1884; Moldenke and Moldenke 1952; Stark 1917; Thomson 1934).

The popularity of mandrake in Europe began to decline in the sixteenth century. Its alleged magical properties were criticized and ridiculed by scientists (Gerard 1633), and even its legitimate use as an anesthetic gradually disappeared: "First, better pain relievers were becoming available; secondly, the plant was so thoroughly linked to superstition that medicine, surgery, and pharmacy simply abandoned it in their quest for respectability" (Grover 1965).

Although there are some recent mentions of mandrake root being used as a love charm, the thousands of years of its fame seemed to be over. People were apparently disappointed and embarrassed to find nothing in it. The whole subject came to be treated with disdain and was eventually abandoned. Today mandrake is barely known as a historical relic.

We believe, however, that the case of mandrake ought not to be closed. Mandrake was brought up in the events described in the Book of Genesis 30:14–16. This plant is mentioned favorably; however, the actual account of its use is not provided.

Citation of these famous passages from the Pentateuch and the attempts to rationalize the mentioning of mandrake are presented in a multitude of works written about this plant. These studies viewed its possible function in the Bible in line with beliefs in the miraculous sexual effect of the mandrake root common to Assyrian, Canaanite, Greek idolatry or Medieval European superstition for which no scientific evidence has ever been found.

It seems to us that such an approach to the Biblical research is erroneous. It contradicts the intrinsic logic of the Bible, the quintessence of which is the nullification of idolatry in all its manifestations.

From this perspective, a concept derived from polytheistic practice is invalid for the explanation of Biblical phenomena. In this case meaningful results may only be achieved through acceptance and utilization of basic Biblical premise.

Yet, we are confident that the mandrake was introduced to the Biblical scene not for any kind of magical reasons, but for natural qualities which so far have escaped the attention of scientists.

From this position we undertook a new attempt to find the qualities of mandrake ascribed to it in the Scripture, as well as to re-evaluate its possible role in Biblical events.

The Biblical Text

The contemporary translation (Kaplan 1981) of the passage from the Book of Genesis 30:14–16 that mentions mandrake (dudaim) is as follows:

"Reuben went in the days of the wheat harvest and he found dudaim in the field. He brought them to his mother Leah. Rachel said to Leah, 'Please give me some of your son's dudaim'. 'Isn't it enough that you have taken away my husband'? retorted Leah. 'Now you want to take my son's dudaim'.

'Therefore', replied Rachel', [Jacob] will sleep with you tonight in exchange for your son's dudaim'.

"When Jacob came home from the field that evening, Leah went out to meet him. 'You will come to me', she said. 'I have paid for your services [hired you for] with my son's dudaim'. He slept with her that night."

Plant Name and Identity

There has been controversy about the translation of the names of other famous Biblical plants, such as hyssop (Fleisher and Fleisher 1988) but the word *dudaim* created no such problems. Nor did the identity of the plant. The Septuagint (first translation of the Torah from Hebrew to Greek) rendered it as "meela mandragoron," or "apples of mandrake." The identification of Biblical dudaim with mandrake, *Mandragora officinarum* L., has been accepted almost universally (Feinbrun-Dothan 1978; Moldenke and Moldenke 1952).

As to the translation of *dudaim* into other Semitic languages, Ramban (Nachamides) states in his commentary on Genesis 30:14: "It is best to accept Onkelos' opinion concerning the translation of *duda'im,* which he rendered [in Aramaic] as *yavruchin* (mandrakes). In [Homiletical commentary] Bereshith Rabbah 72:2 it is also explained similarly: 'Rabbi Chiya the son of Rabbi Abba said, "Yavruchin,"' and these are yavruach in Arabic" (Ramban 1971).

The ancient Arabic name for mandrake is abu'l-ruh which must be understood as "master of the breath of life" or "lord of spirit" rather than "father of spirit." The form *Y'abrauch* mentioned by Scripture commentators is used in Arabic when the subject is directly addressed: Y'abrauch, or O, You, Master of the Breath of Life. The name itself and the form in which it is used rather strongly suggest that mandrake was considered a deity in the pre-Islamic period. After the spread of Islam, the name gradually gave way to a new one reflecting disgust with idolatry and pointing to the dangerously tempting nature of this plant. The fruit of the mandrake is still believed to arouse passion and voluptuousness, and therefore, what was once called "Master of the Breath of Life" became Tufah al-jinn or Bayd-al-jinn, meaning, respectively, "apples" or "testicles" of the demon.

The etymology of the word dudaim (Fig. 1 [1]) is rather obscure. It is phonetically close to the word for "two lovers," or "couple in love," but in that case it would have been pronounced *dodaim* and would be spelled dodim (Fig. 1 [2]) without the letter aleph. Yet most Scripture commentators agree that the word *dudaim* is a derivation of the root "Dod, David" (Fig. 1 [3])

1. דודאים 2. דודים 3. דד, דוד
4. דוד&אים 5. דו&דאים 6. דאה
7. שם אתן את דודי לך
הדודאים נתנו ריח
8. ותאמר רחל לכן
9. לכן

Fig. 1. Hebrew terms and Scriptural verses used in the study of Biblical mandrake.

denoting "passion," "carnal love," "beloved" (Ramban 1971). We believe that it is possible to interpret *dudaim* as the juxtaposition of "dod" and "ayim" (Fig. 1 [4]), love and terror, or fear ("ayim"—fear, Habakuk 1:7). Love is the strongest of human emotions. It is a Biblical message that love governed by the moral laws (followed for no other reason but fear of God) provides the greatest happiness in life (". . . a man shall therefore leave his father and mother and be united with his wife, and they shall become one flesh," Gen. 2:24, or "I am my beloved's and his passion is toward me," Song. 7:11). Morally unrestricted love, on the other hand, carries with it destruction and the darkest terror for the human soul ("and I find more bitter than death the woman . . . ," Ecclesiastes 7:26).

This interpretation allows us to see the name *dudaim* as a warning that the plant itself can be used to support either the righteous love taught by the Bible or the false and fearful love through idolatry and sin, as has been the case for most of human history.

The word *dudaim* can also be interpreted in accordance with the suggestion of Shauli, who proposed seeing it as a combination of "du" and "daim" (Fig. 1 [5]) (Shauli 1989). *Du* is an ancient Semitic word designating the number two. In Hebrew it is used not as a separate word, but as a prefix similar to "bi" in English. *Daim* is a plural form of the verb "da-ah" (Fig. 1 [6]) which means "to glide," "to fly in the air" (Psalms 18:11). In this view *dudaim* would literally mean "two, soaring (in the heavens)." In Hebrew, as in many other languages, the state of love is often associated with elevation, or being in heaven. The word *dudaim* would therefore connote the exaltation of love.

These additional interpretations by no means contradict the earlier ones given by the scholars in Law. On the contrary, they complement them by enhancing their meaning, pointing to nuances in the complex emotion of love and narrowing grammatical ambiguity.

The Event

It seems to us that the incident involving mandrake occurred at one of the most difficult moments in the Patriarch Jacob's life. Jacob was a modest, quiet man, whose life in the house of his highly spiritual and wealthy father was devoted to study (Gen. 26:27). In Laban's house he spent nearly 15 years as a stranger deprived of the spiritual environment so vital to him. The sole monotheist, he was considered bizarre by the wicked pagan Laban and the ambient society. He was despised and humiliated for his poverty. Laban saw and remembered the riches sent to his father by Abraham as the dowry for his sister, Rebecca (Gen. 24:30). He expected the same and

could not forgive Jacob for coming empty handed. Indeed, Jacob arrived at Laban's with nothing but a cane (Gen. 32:11).

At the time we are considering, Jacob was over 80 years old, exhausted by the hard field work required of him (Gen. 31:40) as the sole provider for a family of nine. His private life lacked peace and was strained by stress. He was deeply upset with his father-in-law for having tricked him into marrying Leah and for having extorted an additional seven years of unpaid labor as a dowry for Rachel. He had not forgiven Leah for not revealing her identity and for posing as Rachel on the wedding night.

It seems than during this period Jacob lost, at least to a degree, his spiritual connection to God, a loss reflected in the fact that for a long time he failed to recognize that his marriage to Leah had divine support and approval.

In this period he was furious even with his beloved Rachel (Gen. 30:2), and his anger was not just (Ramban on Gen. 30:2 ibid). To put it in contemporary terms, Jacob's life was stressful and dominated by negative emotions. He was married to two sisters divided by mutual envy, for: "Jealousy is cruel as the grave; the flashes thereof are flashes of fire" (Song. 8:6).

The nucleus of the House of Israel was in crisis, its future uncertain.

The young boy Reuben, seeing his mother's suffering, brought mandrake to Leah because he knew of its ability to arouse love. Leah knew of it too, and when Rachel asked for the mandrake, she, driven by jealousy, suspected an attempt to win Jacob away from her completely. That is why she said: "Isn't it enough that you have taken away my husband?" (Gen. 30:15). But this was not Rachel's intention. At this critical point she found in her heart the spiritual power to rise above natural envy and discontent in favor of happiness and harmony with the people close to her.

Her only motivation was, "Do what is upright and good in God's eyes" (Deuteronomy 6:18).

Although she was right in her dispute with Jacob, she did not demand justice but sought to make peace by honoring him and showing her love in a dignified way.[b] At the same time she offered her sister true peace and an end to all animosity and tension, saying: "you go ahead, take my place and be with him this night,"[c] thereby sparing Leah the disgrace of trying to win Jacob's attention through an artificial stimulant. Leah accepted the proposed peace without suspicion or reservation, as a complete truth. For that she was blessed (Gen. 30:17). A miracle was performed for Rachel; her barrenness was cured. "God remembered her, heard her and opened her womb. She became pregnant and gave birth to a son" (Gen. 30:22, 23), whom she called Joseph.

Peace came upon Jacob.[d] He now felt strong enough to tell Laban that it was time for him to go. In this he had the support of his entire household, since after these events both Rachel and Leah felt that they belonged to the family of Jacob and were but strangers in their father's house (Gen. 31:15). Only then did Jacob gain the strength to take care of the family's welfare (Gen. 31:43) and become spiritually worthy of the Lord's blessing (Gen. 31:3). It was then that the family of Jacob, the House of Israel, really came to be.

Mandrake, treated with endearment and respect by the family of Jacob, was central to these events. Commentators of the Bible saw the role of mandrake positively. Rabbi Levy writes in Bereshith Rabbah 72:4: "Come and see how wonderful was the mediation of the Mandrakes before One who said 'There shall be the world', that through the Mandrakes two great tribes arose in Israel—Issachar and Zebulun."

It is hard to over-estimate the importance of these events, and it seems evident that mandrake, which played such a dignified part in them, ought to have qualities and a value commensurate with their significance.

The Elusive Quality of Mandrake

The only information provided by the Book of Genesis about mandrake is that implicit in the term *dudaim* (see above) and in the proper time of gathering, which corresponds to a particular stage in the plant's development. Mandrake's actual physical qualities and the way they were used remain obscure.

The answer to this problem lies in the Song of Songs 7:13—"The mandrakes give forth fragrance . . ."—and is confirmed in Testaments of the Twelve Patriarchs; Testament of Issachar 1:3, 5, 7: "My brother Reuben brought mandrakes from the field . . . and there were fragrant apples growing above the water beds in the land of Aram."

This strongly suggests that the prized quality of mandrake was its smell.

Since very few secular researchers acknowledge even the existence of the odor of the mandrake fruit, and others claim that neither the flower nor the fruit possesses any smell at all (Moldenke and Moldenke 1952), we decided to study this matter in detail.

The smell of the mandrake fruit, we discovered, is not an easy subject for scientific study.

The first problem we encountered was the gathering of the fruit.

Many botanical sources state that the fruit ripens in the month of May. Trying our best in the limited time we could devote to non-business expeditions, we looked year after year in various locations in the Holy Land that are listed as mandrake habitats (Feinbrun-Dothan 1978). From time to time we found wilted plants, but no sign at all of the "love apples."

Although *M. officinarum* plants are not very common, they can be seen in the early spring. The large rosette of dark green leaves with a small bouquet of violet flowers hidden in the center is easily spotted. Later the leaves dry out, leaving green berries scattered on the ground, covered by the lush late spring vegetation. The berries rarely survive to ripeness, and chances of finding them are slim.

Attempts to seek professional advice were unavailing. Surprisingly, few researchers knew anything about mandrake beyond popular folklore. Our requests for information about possible locations of substantial populations of the plant usually elicited not an answer but a counter-investigation based on the suspicion that we were looking for drugs.

As a last resort we decided to follow Reuben's lead and search for mandrake in the fields. It did not make sense to look in the areas of intensive agriculture since deep plowing and vigorous cultivation destroys the roots of *M. officinarum.* But a few farmers grow barley and wheat on large tracts of non-irrigated marginal land; some of them allowed us to follow their machinery during the spring 1991 wheat harvest.

This was, at last, a success. The smell of the mandrake fruit was everywhere, the harvest of "love apples" plentiful. Only then could we fully appreciate the meaning of the Biblical phrase, ". . . went in the days of wheat harvest and found mandrakes in the field." These few words, in fact, accurately describe the only practical way of gathering mandrake fruits. Out of curiosity we also looked for fruits in fields harvested a day before. After a long search, only two dirt-covered berries were found. On the third day we found nothing at all. Birds and field animals find the juicy flesh of the mandrake berries irresistible.

The Mandrake Fragrance

While not being able to expose the reader to the smell of mandrake, we will try to describe our perception of it, as it is done in perfumery, by way of association. The odor of mandrake is unique. It is not perceived as a smell of classic fragrant flowers like rose, lily or jasmine. There is a hint of subtle danger in it. Intoxicating and addictive, it makes a powerful impression on one's memory and evokes images of unspoiled wilderness, desert wind, excitement of danger and romantic exaltation.

Capturing the elusive aroma of mandrake was another problem. The smell is perceptible only when the berries are fully ripe. Even slightly green fruits emit no odor. The berries are thin skinned and very juicy, and like small tomatoes (also Solanaceae) they can be kept fresh only for a very short time. The smell of over-ripe fruits soon loses freshness, becoming heavy and unpleasant. Refrigeration does not help because it alters the aroma of the fruits considerably.

To preserve the odoriferous constituents of *M. officinarum,* the fully ripe berries were crushed in the presence of methylene chloride to halt the biochemical processes and to extract the volatile constituents. Before the laboratory studies, the extract was kept frozen. The extract mixture was defrosted, the methylene chloride layer decanted, filtered, and gently concentrated under slightly reduced pressure. The concentrated extract was used, as previously described, for gas-chromatographic/mass-spectral identification of volatile constituents (Table 1).

The major part of the aroma of *M. officinarum* is made up of various esters. Among these, the light esters, together with trans-2-hexenal and hexanol, are typical flavor constituents of many common fruits, such as apples. The nuances reminiscent of tropical fruits are due to the presence of such components as 3-phenylpropanol, which occurs in guava and feihoa; ethyl-3-hydroxy butyrate, found in papaya, mango, guava, and passion fruit; and 3-phenyl-propyl acetate, which is important in the flavor of guava.

It is interesting to note the presence of even-

TABLE 1. AROMA CONSTITUENTS OF *MANDRAGORA OFFICINARUM* L. (FLEISHER AND FLEISHER 1992).

Compound	Percentage
Ethyl acetate	0.88
Methyl butyrate	0.03
Ethyl butyrate	21.60
Ethyl 2-methyl butyrate	0.19
Butyl acetate	9.08
Hexanal	0.25
Propyl butyrate	0.22
Butanol	4.09
Limonene	1.20
Butyl butyrate	2.44
(E)-2-hexenal	0.20
Ethyl hexanoate	3.03
Amyl alcohol	0.06
Hexyl acetate	6.94
3-hydroxy-2-butanone	0.34
Hexanol	14.02
Isopropenyl benzene	0.03
Propyl hexanoate	0.22
Hexyl butyrate	1.00
Ethyl octanoate	2.24
Octyl acetate	0.62
Ethyl-3-hydroxy butyrate	4.15
Benzaldehyde	0.30
Indanone*	0.04
Linalool	0.38
Octanol	1.85
Ethyl 3-methyl thiopropionate	1.48
Hexyl hexanoate	0.22
Methyl 4-methyl thiobutyrate**	1.59
Ethyl decanoate	1.37
Ethyl benzoate	0.04
α-terpineol	0.02
γ-hexalactone	0.02
3-methyl thiolpropanol	4.44
Benzyl acetate	0.39
Carvone	0.04
Decanol	0.56
Isobutyl decanoate	0.20
β-phenethyl isobutyrate	0.03
Ethyl laurate	0.49
Benzyl alcohol	0.70
Henylethyl alcohol	0.30
3-phenylpropyl acetate	0.66
Methyl eugenol	0.40
γ-octalactone	0.02
3-phenylpropanol	2.98
2-ethyl-4-hydroxy-5-methyl-3(2H) furanone	0.04
Ethyl cinnamate	0.49
γ-decalactone	0.02
(E)-cinnamyl acetate	0.33
Eugenol	2.37
Cinnamyl alcohol	1.96
(E)-isoeugenol	1.63
γ-dodecalactone	0.24
Vanillin	0.03

* Tentative identification.
** Structure determination based on mass spectra interpretation.

numbered γ-lactones, which, in spite of their small concentrations, make a powerful contribution to the smell of mandrake.

The unique feature of mandrake's aroma is the presence of substantial quantities of sulphur-containing chemicals. These are probably responsible for the warning notes in the smell of the fruits.

Sulphur-containing chemicals are found in many common vegetables whose smell is considered acceptable but not necessarily pleasant: onion, garlic, cabbage, etc.

Among the multitude of aroma materials known to us through long involvement in the fragrance and flavor industry, mandrake is the only one that contains such a high proportion of sulphur compounds while still clearly belonging to the category of fragrances.

THE PERCEPTION OF MANDRAKE IN THE SCRIPTURE

Although superstitions about the human-shaped mandrake root and its alleged power to help achieve pregnancy were well known to scholars of the Bible, such eminent commentators of the Torah as R'adak, Ibn Esra, and Ramban unanimously rejected the idea that either Leah or Rachel sought to use mandrake to aid conception[e] (Anonymous 1987).

The opinions of commentators on the aphrodisiac qualities of mandrake are more positive. The existence of these qualities is cautiously asserted, and attributed not to the root but to the fruit, and specifically to its smell.

The boldest opinion was expressed by the physician and reputable Hebrew theologian Sforno, who lived in Renaissance Italy. His commentary on Genesis 30:14, while opposing the idea that sexual satisfaction was the motivation for the events, explains that mandrake is a "fragrant plant which affects the functioning of male sexual organs . . . and increases the desire of love-making"

(Anonymous 1987). Sforno cites the Song of Songs as the basis of his conclusion.

From this and the previously presented considerations we conclude that from the Biblical perspective the smell of mandrake fruit does in fact cause sexual excitement. However, these qualities of mandrake were not actually used in the Biblical events.

The Scripture treats matters of fragrance with great respect. It is commanded that a golden altar be constructed for the exclusive offering of sweet incense in the Temple (Exodus 30:1–9), and the unique formula for this incense is specified (Exodus 30:34–38).

Recognition of the profound effects of fragrances on human psychology is found in the Talmud, which in Berachoth 43:2 states: "The smell does not affect the matter (body) but is beneficial to the soul."

Although the mechanism is not known, everyone is aware of the power of scent to affect mood, awaken forgotten memories, and induce sudden associations. It seems to us that the fragrance of mandrake triggered Rachel's change of heart and brought her to a new outlook on life.

The theme of scents is expressed most elaborately in the Song of Songs. On its literal (yet fully valid) level, this Book, devoted to the love of God, praises human love as prime among emotions and as the quintessence of life:

"Many waters cannot quench love,
Neither can the floods drown it;
If a man would give all the substance
of his house for love,
He would utterly be condemned"

(Song, 8:7)

Well-known fragrances and spices—frankincense, myrrh, aloe, cinnamon, etc.—are repeatedly mentioned in this Book to enrich emotional background and to highlight the moral and physical perfection of the beloved. Mandrake holds a very special place within it;[f] its fragrance is directly associated with the ultimate expression of earthly love (Fig. 1 [7]) which translates into English as:

". . . there will I make love to you,
The mandrakes gave forth fragrance . . ."

(Song. 7:13, 14).

The Scriptural link between the fragrance of mandrake and human sexuality therefore seems firmly established.

Conclusion

The Scripture makes a clear connection between the smell of the mandrake fruit and the emotion of love. It therefore provides the first—and probably the only—known account of the direct influence of odor on human sexuality.

We will not go so far as to assert that the smell of mandrake is the love-smell so highly sought after by perfumers, but the possibility certainly seems worthy of scientific clarification through further studies. After all, civilized humanity invested huge resources and countless years in futile exploration of mandrake root.

Study of the influence of the odor of mandrake on human sexual behavior would seem to be promising and would, at least, have the authority of the Bible behind it.

But it is also possible that to feel the effect of dudaim may require either the moral purity and spirituality of the Matriarchs or the wisdom and emotional depth of King Solomon and his beloved.

Endnotes

[a] It is interesting to follow the strange development of superstition about the gathering of mandrake. All the authors writing about mandrake cite Josephus's *Judean War* VII. 6:3 in connection with the dog-digging of the root and its miraculous qualities. It seems, however, that Josephus was not talking about mandrake. He describes the plant Barras, which grows around the town of that same name near the Dead Sea. This is quite an unlikely habitat for mandrake. Well versed in Hebrew, Aramaic, and Greek, Josephus does not use the names "dudaim," "yavruchin," or "mandragora." He does not even say that this plant grows in other areas of the Holy Land. Josephus, of course, knew that mandrake grows around Jerusalem. Being a learned priest of the Temple, even if he never saw it, he would have read about mandrake in the Song of Songs. If Barras and mandrake were the same plant, he would have said so. Most probably, he did not think they were.

[b] Jacob's role in these events was that of a follower and not a leader. The matter was decided by the Matriarchs, and Jacob abided by their resolution.

His father, Isaac, and his grandfather, Abraham, also accepted their wives' decisions in critical family matters, but while Isaac was tricked (Gen. 27:8–33) and Abraham forced into agreement (Gen. 21:10–12), Jacob accepted it without reservation.

Rachel's courage, which saved Jacob's family and led to its future prosperity, laid the foundation for the renowned leading role of women in traditional Jewish households.

[c] The words of the Book of Genesis 30:15 (Fig. 1 [8]) are usually understood as "And Rachel said, Therefore . . ." based upon the meaning of the word "lochen"—therefore. But this word has an additional meaning in Hebrew: "to you," "yours," the second person plural possessive feminine pronoun. Considering this and the ancient traditional tune of Torah reading—"trupp"—which sets apart the word "lochen" (Fig. 1 [9]) we would like to suggest that what Rachel actually said was: "(He is also) yours," addressing both Leah and her handmaid.

[d] It appears that the stressful atmosphere of the early years of family life had deep psychological effects on Jacob's older sons.

Reuben grew up an overly emotional person. From childhood he was unable to cope with emotional tensions in the family. He was only four or five when he went to look for the mandrake in the hope of restoring the love between his parents. He confronted his brothers to save Joseph's

life (Gen. 37:21, 22), and he is the only one who cried in regret of the evil done to him (Gen. 37:29; 42:22).

He always meant well, but the uncontrolled emotion of love incited him to strange acts (Gen. 36:22) and inclined him to senseless ideas (Gen. 43:37). To him the dying Jacob addressed the sad but tender words *pachaz ka-main* (Gen. 49:4)—unrigid like water, emotionally unstable.

Throughout the Biblical story he appears to be the only rightful owner of the mandrake, since both Leah and Rachel refuse to claim ownership, referring to it only as "my son's mandrake" or "your son's mandrake."

Arabs in the Holy Land call mandrake fruits "Tufah al (apples of) Majnun." After the famous seventh century love poem *Majnum Layla*, the term *Majnun* "the obsessed" in Islamic literature became a symbol of complete surrender to the forces of love. The term would seem to fit Reuben. Perhaps the wonderful fruit of the mandrake should also be called "Dudaei Reuben"—Reuben's mandrakes.

[e] There is no doubt that Rachel, being a sensible person, would have exhausted all medical means at her disposal before asking that Jacob pray on her behalf, as scholars explain (Ramban on Gen. 30:1 ibid).

[f] We were amazed to note that a Book of such great spiritual importance is also so precise in small details. Chapter 7:13, 14 mentions the blooming of pomegranates and the appearance of the fragrance of mandrake. These two events really coincide in nature. While harvesting *M. officinarum* fruits in the fields, we saw bright orange-red pomegranate flowers in the backyards of every house on the surrounding hills.

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Book Review

Plants in Wetlands. Charles B. Redington. 1994. Kendall-Hunt Publishing Company, 2460 Kerper Boulevard, P.O. Box 539, Dubuque, Iowa 52004. 393 pp. (paperback). No cost stated. ISBN 0-8403-8993-3.

The author has produced a most interesting and useful field guide to plants found in wetlands east of the Mississippi River (but excluding the bulk of Louisiana and Florida). The book is organized into two parts; the first is a general introduction to these habitats, and the second is a treatment of the plants found in wetlands. The species are organized by common names, and each is accompanied by a simple but elegant black and white drawing. Apart from the usual description of the plant, this interesting book has sections on community interactions, mammals, birds, reptiles, amphibians, insects, spiders, and human/economic use. The latter category would be of great interest to the readers of this journal, and much information on the economic botany of these species can be found in this section. For example, under *Nymphaea odorata*, we learn that the leaves, roots, and tubers have been used variously as edible pot herbs, a soap substitute, throat gargle, and as a poultice for dressing wounds. The final section of the book contains a series of forms where observations can be recorded on each of the individual species. All in all, I believe that this would be an enjoyable book to have in one's possession while wandering around in wetlands areas.

Michael J. Balick
Institute for Economic Botany
The New York Botanical Garden
Bronx, NY 10458

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Influence of Religion on the Spread of Citrus

The religious practices of the Jews helped effect the introduction of citrus to Mediterranean lands.

Erich Isaac

When Goethe wrote the famous poem beginning "Kennst du das Land wo die Zitronen blühen?" he presumably referred to Italy. Of course, lemons as well as citrus fruits as a whole are not limited to Italy or even to the Mediterranean basin but grow in areas as widely separated as Japan, India, South Africa, and California. Indeed, while citrus is associated with areas which may be described as of Mediterranean climate, it is practically a newcomer to the Mediterranean itself and was introduced there through what is today the least familiar member of the genus—the citron or *Citrus medica* (*1*). This fruit was the first of its genus to be cultivated intensively in the Fertile Crescent of the ancient Near East—namely, Mesopotamia, Syria, Palestine, and Egypt. It owed its distribution into the Roman Mediterranean to the Jews, for whom the citron had become an object essential for the ritual celebration of the holiday of the Feast of Booths. The history of the citron is to me a striking illustration of the part, far too little recognized, played by religion in transforming the landscape.

The citron, *Citrus medica* var. ethrog Engl. (*2*) (see Figs. 1 and 2) belongs to the subfamily Aurantioideae. The citron tree (see Fig. 3) is a small evergreen with irregular and spreading spiny branches, pale green oval and slightly serrated leaves, wingless petioles, and generally perfect flowers. It produces a fragrant golden oval or oblong fruit 4 to 8 inches long with a knobby skin. The citron's protuberant nipple carries a persistent pistil. While in most citrus trees flowering takes place in the early spring, the citron continues throughout the year to produce flowers in varying degrees of abundance. This absence of a period of dormancy makes it, of all the citrus species, perhaps most susceptible to frost damage and limits the range of its commercial cultivation. The citron is mainly cultivated in coastal sections where frosts are infrequent. The development of fruit in interior sections is often inhibited by high temperatures (see *3*, pp. 42–3, 55, 62).

The author is a member of the department of geography at Temple University, Philadelphia, Pa.

The tree grows on a great variety of soils, provided that the content of organic matter is satisfactory. Soil texture is the most important characteristic. The tree does best on fine sandy loams, although in Tunisia, perhaps the most important commercial citron area of North Africa, plantings are sometimes made on pure sand (*3*, p. 64; *4*). It is interesting that commercial cultivation of a tree so obviously adapted to the tropical rain forest (because of the absence of devices limiting transpiration or evaporation, lack of a regular dormant period, weak root-hair development, and nearly naked buds) (*3*, p. 51) should today occur overwhelmingly in areas of Mediterranean climates.

Origin and Spread of Citron

When did the Jew first become acquainted with the citron, or etrog, as he calls it? This is a question which has not yet been conclusively determined and involves the problem of the origin and transmission of the species *Citrus medica*. Nineteenth- and early 20th-century observers, on the whole, concurred in asserting that the citron, lemon, and lime originated on the Himalayan slopes of India and Burma or in the southern part of the Indian peninsula (*5*). There were a few dissident voices, as, for example, E. Bonavia, who came to doubt an Indian origin for the citron when he noted its prevalence on India's western shore, an area which had been most open to foreign influences (*6*). In the 20th century there has been practically unanimous agreement that southwest Asia was the origin of citron, but whether in India or further west in southern Arabia is still a subject of dispute (*7*).

It is surprising that not more attention has been paid to the Arabian peninsula as a possible area of origin of citron, inasmuch as various reports suggest the probability that this area was its native home. Such an authority on citrus as Walter T. Swingle reverses the usual theory that citron spread from India to Media and Persia and then to the Mediterranean by hypothesizing an origin between India and Africa:

"The early advent of the citron in Media and Persia, and subsequent slow penetration into India and China could be explained easily if the citron should prove to be a native of southern Arabia. The bael fruit of India, Aegle Marmelos, has no close relatives in Asia, but three closely allied genera, Aeglopsis, Afraegle, and Balsamocitrus are found in Africa. Citropsis, an African genus of the Near-Citrus fruit trees closely related to the

Asiatic genus Atalantia, has eleven species. It would not be surprising to find midway between India and Africa, in some mountain oasis within the tropical zone in Arabia, the citron growing in a wild state" (*8*).

When did the citron spread from its place of origin—whether this was India or Arabia—to the Fertile Crescent, where the Jew might have found it a part of the regional flora? Traditionally the citron is accepted as the fruit commanded by the Bible for use in the ritual observance of the Feast of Booths, an ancient Hebrew festival originally known as the Feast of Ingathering (see Exodus 23:16; 34:22). Leviticus 23:40 reads: "And you shall take unto yourself on the first day the fruit of a goodly tree, palm branches, foliage of a leafy tree, and willows of the brook, and you shall rejoice before the Lord your God seven days." There is, of course, no reference to the citron here, nor is the etrog mentioned by name anywhere in the Bible. Not until the second century B.C. do we possess ample documentary evidence that the citron was the fruit accepted as "the fruit of a goodly tree." Nonetheless, Jewish religious authority of that period maintained that the citron had always been used and was the original fruit designated by the Bible.

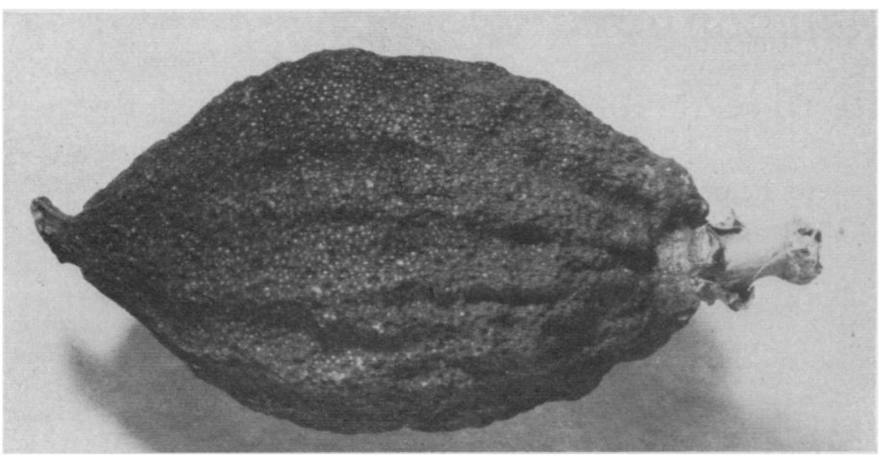

Fig. 1. The citron or etrog. [Frank J. Darmstaedter, Jewish Museum, New York]

Fig. 2. Fruit lying in a silver etrog receptacle (Germany, 18th century). [Frank J. Darmstaedter, Jewish Museum, New York]

This identification of the citron with "the fruit of a goodly tree" commanded at the time of the wanderings in the desert has not gone unchallenged. The argument has been advanced that the Feast of Booths was not celebrated until the time of Ezra and Nehemiah in the fifth century B.C., when the first actual celebration of the feast is described. According to this view, favored by Gallesio, de Candolle, and other authorities, the feast was held then for the first time. Such a theory, of course, presumes a late composition of Leviticus 23:40, since it does not deny the identity of "the fruit of a goodly tree" and the citron but considers that the Jews came in contact with the fruit during the exilic period in Babylonia and brought it back with them to Palestine on their return from the captivity. In the absence of clear proof one way or the other, the first problem is to establish the earliest period at which the citron could have been part of the Levant flora and thus available to the Jews in Palestine.

It is known that in ancient times the lands between the Mediterranean, the Red Sea, and the Indian Ocean were bound together by extensive economic and cultural interchange. Scholars now assert the impossibility of regarding the cultures of the ancient East and Near East as hermetically sealed entities which achieved their flowering independently of the cultural developments in surrounding territories. As early as the fourth millenium B.C. the cultures of Mesopotamia, Syria, Palestine, Egypt, and probably Asia Minor were jointly on the road to civilization, and the contacts were so marked that it may indeed be possible to consider Babylonian and Egyptian civilizations as regional variants of one culture (*9*). Babylonian cylinder seals, pottery types, art motifs, architecture, and early writing all stimulated Egyptian productions of the same nature. Moreover, these contacts were probably not limited to the Fertile Crescent but encompassed the furthermost reaches of the Red Sea. A predynastic ivory showing sailors with a strange craft, which Sir Flinders Petrie interprets as depicting the arrival in Egypt of a ship from Punt (either Somaliland or southern Arabia), is one example of these far-reaching contacts (*10*).

Nor were these contacts limited to the

Fig. 3. Woodcut of branches of a citron tree with fruit. From John Gerard's herbal, *The Historie of Plants* (Printed at London by John Norton, 1597), p. 1278. [W. Hausdorfer, Sullivan Memorial Library, Temple University]

inception of civilization; they continued through the centuries. The Mari Archives, found by a French expedition in 1936, illustrate the freedom of movement in the world of the Fertile Crescent. "Trade was widespread and caravans of merchants were among the commonest sights" (*11*, p. 5). The Biblical picture "of limited movements in the hill country of Palestine, of seasonal migration between the Negeb and Central Palestine, and of easy travel to Mesopotamia and Egypt is, accordingly, so perfectly in accord with conditions in the Middle Bronze Age that historical skepticism is quite unwarranted" (*11*, p. 6). The Bible describes extensive commerce in the tenth century B.C., between Phoenicia, Egypt, southern Arabia, and adjacent regions, as well as with Hittite northern Syria and Cilicia. Elaborate trading expeditions were organized by Solomon and Hiram of Tyre (969–936 B.C.), whose scope embraced the Red Sea, the Indian Ocean, and probably the Mediterranean (Kings I, 9:26; 10:22). This extensive trade was carried on both by sea and by land, land trade having been made possible by the domestication of the camel not long before the 11th century B.C. At the time of Solomon we know that Somaliland and southern Arabia, separated from it by the Red Sea, were considered to be one region. This identification dates back to a period at least as early as the 14th century B.C. (*12*).

We have evidence also of the Egyptians' familiarity with this region. Egyptians traveled from Kosseir to "the divine land" or "the frankincense terraces," terms generally understood to refer to the African shore from Massawa to Somaliland, and to southern Arabia (*13*, pp. 6–9). Punt yielded to the Egyptian kings incense and gold and emeralds (Pliny, xxxvii, 66), and an indication of the closeness of contact is the boast of one traveler of the period of the Middle Kingdom that he had been to Punt 11 times (*13*, p. 7).

We have no certain evidence as to whether the exchanges between these various regions involved the transportation and transplantation of seeds before the 16th century B.C. The first extant record dates back to about 1500 B.C., when Queen Hatshepsut of Egypt imported incense trees "to make for Amon a second Punt in his garden" (*13*, p. 7). Her ships are depicted, in color reliefs, as 30 saplings are brought aboard them in tubs, while the native ruler looks on. We know that trade with Punt continued to the time of Rameses II and Rameses III (*13*, p. 9). Egyptian sailors may also have penetrated into the Persian Gulf, skirting the Arabian coast, inasmuch as they knew the Euphrates, which they called "the reversed waters" because it flows south, while the Nile flows north.

But if Swingle is right in postulating a southern Arabian origin for the citron, and given the fact of both Egyptian and Palestinian contacts with this region, including the actual evidence of transplantation of trees, the likelihood is great that the citron was transmitted from its place of origin in southern Arabia to Egypt and Palestine in the course of trade. Significant in this light is mention in the Mishna (Succah 3:6) and the Talmud (T. Yerushalmi, Succah, p. 53b and T. Bavli, Succah, p. 36a) of an Ethiopian citron as distinct from the Palestinian. This was probably the Yemenite citron, which has been introduced into Israel in recent years by members of the Yemenite community, a community which was, in ancient times, at various periods subject to Ethiopian or Somali rule.

It is reasonable to believe, then, that the citron was transported from southern Arabia and spread throughout the Fertile Crescent, in which areas favorable to its growth abound. Hospitable habitats exist, for example, along the Nile and in Mesopotamia, where the high moisture requirements of the tree can be amply satisfied and where killing frosts are an exception. There is, moreover, evidence for the presence of citron in Mesopotamia in Assyrian times, when what is most probably a citron is depicted on an Assyrian sculpture (*14*). Seeds of *Citrus medica* were found in southern Mesopotamia in the ruins of old Nippur (*15*), and although precise dating is impossible, from their location in the ruins it is evident that they must date back to the fourth millenium B.C. In the second millenium we find the citron referred to frequently in Assyrian medical texts as *"iltakku,"* which corresponds to the Hebrew "etrog"—the citron. Archeological evidence in the form of a model of a citron indicates its presence in Egypt in the 12th century B.C. (*16*).

Citron as "Fruit of a Goodly Tree"

If the citron spread from southern Arabia through the ancient channels of trade to Mesopotamia, Media, Persia, and India, and northwest to Egypt and adjacent countries, it is quite possible that the citron existed in the better-watered coastal plains of the Levant coast in the period of the early kings of Judah and Israel. It may be, too, that its religious significance to the Jews dates back to that period, if not to an era even more remote. Should the citron, on the other hand, not have been part of the Levant flora, the Jews would have made its acquaintance at the latest during their exile in Mesopotamia in the sixth century B.C.

While the citron's presence does not in itself constitute proof that this was the fruit referred to in the Biblical commandment, the likelihood is enhanced by the fact that the citron tree was considered holy in other cultures, including those of India and China. Contact between the Mediterranean shore lands and the Indian realm extended to the religious and spiritual field. The Indian god Kuerva is usually portrayed carrying a citron or lemon and a variety of citron which has five lobes is called "Buddha's hand" by the Chinese (*17*). The golden bullock around which the Jews danced in the wilderness (Exodus 32) and the golden bulls to which temples were built in the reign of Jeroboam (Kings I, 12:28–33) correspond to or are derived from the storm-god familiar

throughout southwestern Asia from 3000 B.C. to the fourth century A.D. The storm-god was represented standing upon a bull, or merely the bull was shown, with the storm-god understood to be invisibly upon it (*18*).

Further supporting evidence for an early identification of the citron with the "fruit of a goodly tree" is the later insistence of the rabbis that the citron is, beyond question, the tree designated. The arguments are primarily those of rabbis living in the second century A.D., but they represent a long oral tradition. Rabbinical Judaism as a whole has never doubted the antiquity and authenticity of the citron, and rabbinic arguments maintaining it appear to be advanced to prevent the Feast of Booths from falling prey to the influences of syncretism—a danger to which this holiday was particularly subject in view of the many pagan parallels. The extent of the danger is well illustrated by the interpretation Plutarch managed to put upon the Feast of Booths. According to him the holiday was "openly dedicated to Bacchus, for they have a feast amongst them called *Cratephora* from carrying palm trees, and *Thyrsophoria,* when they enter into the Temple carrying thyrsi; what they do within I know not, but it is very probable that they perform the rites of Bacchus" (*19*).

Other cults of the Near East used similar objects, such as pine cones, in their celebration; the rabbis' arguments were designed to prove why the citron, and only the citron, could have been meant and should be used at the time of their writing.

Typical of rabbinic arguments for the citron was the insistence that only in the case of this fruit were both fruit and tree goodly (T. Yerushalmi, Succah 3:5). Another rabbi claimed that *hadar* (which is Hebrew for "goodly") is derived from *hadir* meaning "dwelling," referring to the presence upon the tree in all seasons of the fruit in some stage of its growth (T. Bavli, Succah, p. 35). Rabbinic discussion continued throughout the subsequent centuries. Maimonides held that the identification of citron with the "fruit of a goodly tree" was based upon an absolutely trustworthy tradition. Commentators such as Leon da Modena, who were less firmly convinced of the citron's authenticity, saw in the problem an affirmation of the necessity of tradition. He pointed out that the very fact that it was impossible to know what fruit was originally meant emphasized the importance of tradition as a guide to Jewish law (*20*).

Arguments against Early Presence of Citron in Palestine

Recently a historian of citrus has revived the entire question by stating his belief that the citron could not have been growing in Palestine even as late as the return from Babylonia, by which time the celebration of the holiday was, beyond question, established. Another fruit, according to this view, must have originally been used. S. Tolkowsky, assuming an Indian origin for the citron tree, asserts that the tree had not reached Mesopotamia as late as the end of the fourth century B.C. and did not reach Palestine until the second century B.C. He rejects the evidence of the seeds found at Nippur, arguing that these remains constitute evidence of a tribute of rare fruits brought from a foreign country (*21*, p. 43). But the core of Tolkowsky's theory depends upon Theophrastus of Eresos, who wrote during Alexander's campaign in Asia in the fourth century B.C., in his *Inquiry into Plants,* what has become a classic description of the citron. Theophrastus wrote that the citron is called the "Persian or Median apple," and Tolkowsky deduces from this that the citron was not yet growing in Mesopotamia (*21*, pp. 48–51).

According to Tolkowsky, the ancient and authentic "fruit of a goodly tree" was the cedar cone. He claims that the word *hadar* in the phrase *"pri etz hadar,"* instead of being a single word meaning "goodly," is compounded of the Hebrew definite article *ha* and *dar,* the name of a specific tree—the dar tree, *Cedrus deodara,* a holy cedar of India. The change from the cedar cone to the citron resulted, Tolkowsky believes, from the cone's widespread use in pagan cults. According to Tolkowsky, it was Simon the Maccabee who, in order to emphasize the difference between Jew and pagan, replaced the pine cone with the citron, similar to it in appearance, and struck a coin in honor of his reform, supposedly effected in 136 B.C. The citron is depicted on this coin, together with the "lulav," or combination of palm branch, willows, and myrtle prescribed for use on the Feast of Booths (*21*, pp. 52–57).

One objection to Tolkowsky's ingenious theory is that nowhere else in the Old Testament, which abounds in botanical references, is the dar tree mentioned. Moreover, internal evidence from the text of Leviticus argues against his thesis. The fruit of a goodly tree is only one of a number of items which the Jew is instructed in this sentence to take, and it is unlikely from a stylistic point of view that the definite article should precede only one of the objects whose use is commanded (*22*). Equally without foundation is Tolkowsky's theory of the way in which the citron came to be substituted for the pine cone. The coin upon which the citron's introduction was supposedly celebrated was struck, not in 136 B.C., but, as recent scholarship has disclosed, in the first century A.D. (*23*). Figure 4 shows a similar coin. There is ample documentary evidence from this period that the citron had been in use for a considerable length of time.

As for the evidence of Theophrastus cited by Tolkowsky, this may be interpreted rather differently. At the time Theophrastus wrote, the Persian kingdom embraced the entire Fertile Crescent; hence, the phrase "Persian or Median apple" is ambiguous. Nor does the fact that this name was given to the citron in the particular region where the observer upon whose description Theo-

Fig. 4. A Judean tetradrachm of the second revolt (A.D. 132–135), showing lulav and etrog and the inscription, "Jerusalem First Year of the Redemption of Israel. [Frank J. Darmstaedter, Jewish Museum, New York]

phrastus relied encountered it exclude the possibility that the citron was found in other areas where it might have been known by other names. It should be remembered, too, that Theophrastus did not write of plant discoveries but of plants which had long been familiar to the Greek world (*24*). This suggests that the citron was probably cultivated in areas further west than Media or Persia.

But even if we set aside the flimsy and sometimes actually incorrect specific evidence offered by Tolkowsky, we find that his approach to plant distribution is essentially naive. He implies that, in order for the citron to reach Palestine, it must have traveled in an orderly sequence through successively adjoining regions. Thus the citron could not have been in Mesopotamia before its acclimatization in Persia, and acclimatization in Mesopotamia was necessary before the fruit could be introduced into Palestine. Such a view of plant spread is peculiarly inaccurate in the case of cultivated plants, such as the citron, which are dependent upon human beings for their distribution. Palestine is the meeting place of Irano-Turanian, Saharo-Sindian, and Mediterranean vegetation belts. Furthermore, in the Palestinian part of these belts there are many local enclaves characterized by plant associations ranging from tropical to Alpine, within only 40 miles of each other. Thus the chances for the tree's finding a suitable habitat in Palestine are in no way dependent on its prior introduction to Mesopotamia.

Fig. 5. A stone from an ancient synagogue in Priene, Asia Minor, showing candelabra flanked on the left by the citron, on the right by the lulav. [Kaiser Friedrich Museum, Berlin]

Spread of Citron in the Mediterranean Diaspora

But whatever may have been the fruit originally designated by "fruit of a goodly tree" (and there is no reason why the citron should not have been meant), by the first century A.D. the fruit was firmly established. In the reign of Alexander Yanai, who also officiated as high priest, we know of the citron's widespread acceptance through its use in an unexpected manner. When Yanai, in performing the temple service for the Feast of Booths, deviated from the ritual accepted by the mass of the people, the worshippers hurled their etrogim at him (T. Bavli, Succah 4:9; Josephus *Antiquities,* XIII, xiii, 5). So universal was the citron at this period that the Jews considered adopting it as a standard of measure. Rabbi Akiva, a noted scholar of the first century A.D., arguing against such use of the citron, produced one so large that he was forced to carry it upon his shoulder (*25*). In the Talmud, a scale of sizes is established in which the citron ranks at the head and the mustard seed at the foot (T. Yerushalmi, Nazir 1:4).

While it is beyond dispute that the citron was accepted as the "fruit of a goodly tree" at the turn of the Christian era, what is the evidence that the Jews took the citron with them into the Mediterranean as they formed the early communities of the Diaspora? The reason why they might have done so is clear: The citron had assumed great importance to the rabbis and the common man alike. Rigid specifications were laid down by the rabbis to which all citron used for the holiday ritual had to conform: the fruit must be fresh; its skin must be undamaged; the stigma and style which are carried on its protuberant nipple must be in place; and at least the base of the stalk must be attached to the fruit (*26*).

For the citron was more than an object used in ritual performance; it was a fruit with rich symbolical associations. The evidence for this is found primarily in the stories of the aggadists, who are the source of much of the legend and folklore concerning the Bible. According to one aggadist, the etrog corresponds to the heart of man (*27*). The citron tree, goes another aggadic legend, was the tree of knowledge of good and evil (*28*). Of course Western civilization is familiar with the apple, but this legend, too, grew from aggadic sources, and throughout the Middle Ages the two legends interlocked so that apple and citron were frequently substituted for one another in common usage (*29*).

Not only to the rabbis and aggadists did the citron assume symbolical importance; the common man participated in these attitudes. While no specifically religious symbols appeared in Jewish art until about 40 B.C. (*30,* vol. 1, p. 273), from this time on the citron was one of the most common motifs on Jewish inscriptions, tombs, mosaics, and ritual objects (Fig. 5). Indeed, to a foremost student of Jewish art, the presence of the citron on unquestionably Christian remains is sufficient to indicate the presence of Jews or Judaizing influences (*30,* vol. 2, p. 97).

The accompanying map (Fig. 6) shows the universality of the etrog symbol in the Jewish Diaspora of the early Christian centuries, as well as the extent of Jewish settlement both in towns and on the land. The existence of the symbol on Jewish remains in a given area does not in itself constitute proof that the tree was grown there. Nor does the absence, to date, of the symbol in areas where we know Jewish communities to have existed mean that further archeological investigation would not disclose the citron in these places as well. The probability is great that wherever Jewish communities existed in the Mediterranean world there was common usage of the citron symbol, and that wherever it was at all practicable the Jews not only drew, but also grew, the fruit.

The map further shows, by what is at least an interesting coincidence, that the centers of early Jewish population (with the exception of Israel, these centers are no longer Jewish) roughly coincide with the centers of present-day Mediterranean citrus production—that is, Mediterranean Spain, Algeria, Sicily, Calabria, the Nile delta, and the Levant coast of Israel, Lebanon, and Syria. Morocco and Tunisia are not today primary centers of citrus production, but it is worth noting that one of Morocco's two producing centers for citrus, the Sebu basin (especially the area between present-day Meknes and Fez), coincides with the region of Volubilis, an early Jewish pale. Significantly, moreover, Morocco and Tunisia remain important producers of citron, and up to very recent times the Tunisian citron even supplied sections of the Palestinian market. Morocco continues today to be a source of supply for the American market (*31*). It is my belief that it is the antiquity of citrus culture, originally introduced in these regions by the Jews, for whom cultivation of other citrus species was a by-product of citron cultivation, which explains the persistence of this horticultural specialty. It is interesting, in this light, that citron trees in these areas, certainly from the tenth century on, repeatedly served as grafting stock for other varieties of citrus, particularly the orange (*21*, pp. 105–107; 32).

As Jewish communities multiplied in the Mediterranean Diaspora, references to the citron among non-Jews increased and became more accurate. In the period of Theophrastus the citron was considered inedible by the Greeks (*33*), and as late as about A.D. 70 Pliny recorded the same opinion of the citron (*Historiae Naturalis,* XII, vii, 1). That Jews, on the other hand, ate citron we know from the practice of the period of the Second Temple, when children ate citron on the last day of the Feast of Booths (T. Bavli, Succah 4:7). Coincident with the increased dispersal of Jewish communities came the recognition, by the Romans, that the citron was edible. Indeed, citron recipes became common, and the fruit was frequently prescribed for its supposed medicinal or magical virtues (*34*).

While there is no clear documentary evidence to show that the Jew introduced citron into the Mediterranean, the first records of the cultivation of citron from Jewish and from non-Jewish sources are from those areas with the oldest and largest Jewish communities. Thus, citron is found in the Peloponnesus, one of the earliest centers for Jews outside Palestine, probably at the end of the first century A.D., and there is definite proof of its cultivation there in the second century A.D. (*21,* pp. 75, 77). We know that in Mauritania, another area of early Jewish settlement, the citron was intensively cultivated at the beginning of the Christian era (*21*, p. 69). Clearly, if the citron was grown at all in Italy at this time it was still a rarity. The only really reliable evidence pointing to the presence of citron trees in Italy, where for a long time after their acclimatization they were known as "Palestinian trees," comes from Pliny, who mentioned the citron as one of those trees "which have already become naturalized with us" (*Historiae*

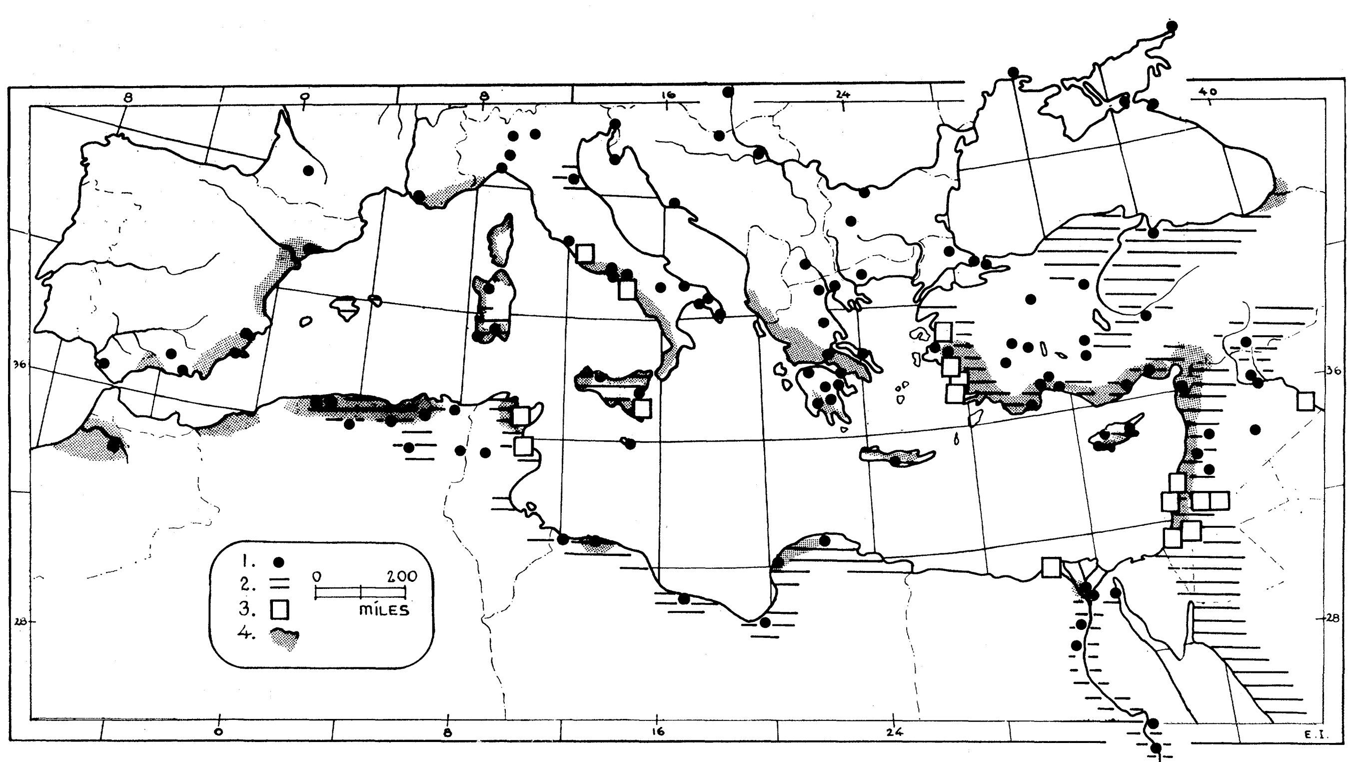

Fig. 6. The Jewish Diaspora of the early Christian centuries (*39*). (1) Cities with large Jewish populations before the fourth century A.D. (so far as known); (2) dense Jewish rural settlement before the fourth century A.D. (so far as known); (3) area in which the etrog has been found depicted in situ; (4) areas of contemporary commercial citrus production.

Naturalis XII, vii, 1). The citron appears in Roman art around the middle of the first century A.D., when it is found as a relief in the tomb of the Haterii on the Via Labicana. It occurs on wall paintings in Pompeii showing Jewish or Judaizing influences (*30,* vol. 2, p. 55). But although the citron was present in Italy, it was by no means a common fruit, for at the beginning of the fourth century its cost was still relatively high. In Diocletian's edict of A.D. 301, fixing prices, the maximum price for a citron was set at 24 denarii, whereas a melon was set at 2 denarii (*35*).

Role of Jews in Introduction of Other Citrus Fruits

It is highly reasonable to assume that the Jews, to whom the citron was such a vital part of religious observance, were the prime agents in spreading the fruit and, as a by-product, in making it acceptable to the non-Jewish population. Only the most perfect fruit might be used as etrogim, and for the less perfect citron it was also desirable to find a market. It is, moreover, highly probable that the Jews introduced other citrus fruits along with the citron and at least contributed to their spread. It is commonly assumed that the orange and lemon were introduced into Europe in the tenth century by the Arabs and that before this time the fruits had been unknown there. But it is scarcely likely that in a period when citron was intensively cultivated, the orange and lemon, fruits which have similar requirements, should have been overlooked by the Jews. Indeed, the Talmud mentions the "sweet citron" (T. Bavli, Shabbath, p. 109b) and the "spherical citron" (T. Bavli, Succah, p. 35a), both of which are now taken to refer to the orange. Different fruits of the genus *Citrus* tended for a long time to be given a common name, and the particular fruit was distinguished by the adjective applied to it. As late as the tenth century the Persian physician Abu-Mansur Muwaffaq stated that oranges were commonly called "sweet lemons" (*21,* p. 106). S. Tolkowsky was the first to point out that sufficient evidence exists in Hellenistic and Roman art and literature for us to conclude that the orange and lemon were known in the early Christian centuries (*21,* pp. 100–109). What appears most probable is that cultivation of citrus other than the citron died out in the centuries following the fall of the Roman Empire and that the fruits were reintroduced by the Arabs.

The Jews became outstanding horticulturists in the Mediterranean in the first centuries of the Christian era, and it may well be that the Jew's need to grow citron was a factor in leading him to pursue this vocation. In Tarragona and Granada Jews owned the vineyards and orchards surrounding the towns (*36*). Jewish ownership of groves in the Balearic Islands at the end of the fourth century is likewise established (*37*). The extent to which Jews were cultivators of land can be shown in Sicily, a center of early citron production, where, by the beginning of the seventh century, Jews worked as *coloni* in large numbers on the lands of the church. In Lombardy the extent of actual Jewish landownership attracted the adverse criticism of Pope Gregory I, who wrote to the Bishop of Luna in Tuscany that he thought it wrong that the Jewish farmers should use Christian slaves on their land. He suggested that the Jews only be permitted to employ Christians as serfs (*38*).

In spite of increasing restrictions imposed on Jewish landownership in Christian Europe from the fifth century on, as late as the twelfth century Jewish horticultural skill was famous. When King Roger of Sicily wished to commence sericulture in Corfu, he imported a community of Jewish horticulturists into that island. It is highly probable that this marked the beginning of the growing of citron on Corfu, which was subsequently to become a primary source of etrogim for the Jews throughout northern Europe.

The spread of citron and the attendant horticultural arts from Palestine to other Mediterranean shores is an instance of the influence of religion upon the development of the cultural landscape. The difficulty of separating out religiomagical motivations from economic, political, and other forces has led to the minimization of the former. The geography of religion is, as a result, the least developed of all geographic specializations. In fact, it has largely become a cartographic exercise in mapping the distribution of obviously religious categories—for example, distributions of population according to religion; distributions of churches, mosques, and other types of religious architecture, and so on. While there is no gainsaying the usefulness of such mapping, it stops short of examining the influence of religion on regional economic structures. Failure properly to take into account religious forces in the modification of the landscape frequently leads to insufficient explanations of historical processes. The early history of citrus in the Mediterranean cannot be explained in terms of economic or social needs but depended upon the religious beliefs and observances of a people, based, in turn, upon rabbinic interpretation of a Biblical commandment. If we accept the view that oranges and lemons were introduced with the citron at an early period, the disappearance of all types of citrus except the citron can similarly be explained only in terms of religious motivation. In the anarchy following the fall of the Roman Empire there was no group to whom the cultivation of oranges or lemons was of vital interest; the citron alone continued to be grown without interruption, and frequently in the face of great difficulties, because it fulfilled the religious obligations of one segment of the Mediterranean population.

References and Notes

1. *Citrus medica* is, indeed, of such minor importance in world trade that the Foreign Agricultural Service of the U.S. Department of Agriculture does not compile data on the world trade in citron.
2. The citron is also known as *Citrus medica cetra, C. medica* var. *lageriformis* Roem., *C. limon scabiosa, C. media* var. *cucurbitina* Risso & Poit. and *C. medica* var. *cylindrica* Hort.
3. See H. J. Webber in *The Citrus Industry,* H. J. Webber and L. D. Batchelor, Eds. (Univ. of California Press, Berkeley and Los Angeles, ed. 1, 1943), vol. 1.
4. J. H. Burke, "The Citrus Industry of North Africa," *U.S. Dept. Agr. Foreign Agr. Rept. No. 66* (1952), p. 113.
5. A. de Candolle, *L'Origine des plantes cultivées* (Paris, ed. 5, 1912), p. 142; W. Roxburgh, *Flora Indica* (Serampore, India, 1832), vol. 3, p. 392; J. D. Hooker, *Flora of British India* (Reeve, London, 1875), vol. 1, pp. 484–517; D. Brandis, *Indian Trees* (London, 1906), p. 122; E. Goetze, *Ein Beitrag zur Kenntniss der Orangengewächse* (Hamburg, 1874), p. 16. After the turn of the century the same view was presented, notably by Sir George Watt in *The Commercial Products of India* [(London, 1908), p. 325].
6. E. Bonavia, *The Cultivated Oranges . . . of India and Ceylon* (Allen, London, 1888–1890), p. 70.
7. I am indebted to E. Milne-Redhead, T. A. Russell, and George Taylor of the Royal Botanical Gardens, Kew, England, and to H. L. Li of the Morris Arboretum, Philadelphia, Pa., for their clarification of current thought on the question of the native home of *Citrus medica.*
8. See W. T. Swingle in *The Citrus Industry,* H. J. Webber and L. D. Batchelor, Eds. (Univ. of California Press, Berkeley and Los Angeles, ed. 1, 1943), p. 397. It is almost certain that there were floral and faunal transfers, attendant on ancient human migrations, between the monsoonal realm of southwest Asia, southern Arabia, and eastern Africa, although the directions and sequences of such dispersals and migrations cannot be established with certainty. Six-rowed barley, developed from *Hordeum agriocrithon,* was probably introduced from India through southern Arabia into Ethiopia. By 4000 B.C. this had become the staple of the Egyptian Badari [see H. von Wissmann, *Erdkunde* 11, 91 (1957)]. Southern Arabia also plays a prominent role in the dispersal of millet and the distribution of Zebu cattle [see E. Werth, *Botan. Jahrbücher* 73, 106 (1943)]; see also the comparison of southern Arabian palms with those of Africa and southwest Asia in M. Burrett, *Botan. Jahrbücher,* 73, 175 (1943).
9. R. Heinegeldern, *Diogenes* No. 13, 82 (1956).

10. F. Petrie, *The Making of Egypt* (Sheldon, London, 1939), pp. 65, 71.
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19. Plutarch, *Symposiaca Problemata* IV, 5.
20. L. da Modena, quoted by I. Löw, *Die Flora der Juden* (Vienna and Leipzig, 1924–1926), vol. 3, p. 287.
21. S. Tolkowsky, *Hesperides: A History of the Culture and Use of Citrus Fruits* (Bale, London, 1938).
22. I am indebted to Prof. Ezekiel Kutscher of the Hebrew University, Jerusalem, for the stylistic analysis of the text.
23. L. Kadman, *Israel Exploration J.* 7, 62 (1957).
24. Pauly-Wissowa, in *Real Encyclopädie der Classischen Altertumswissenschaft* (Stuttgart, 1940), vol. 7, suppl., pp. 1435–1465.
25. The etrog referred to in T. Bavli, Succah, p. 36b, may have been very large indeed. J. H. Burke ["The Citron Industry of North Africa," *U.S. Dept. Agr. Foreign Agr. Rept. No. 66* (1952), p. 39] states that some of the citrons produced in North Africa weigh as much as eight pounds each. In 1673 a certain Padre Gonsales wrote: "In Calabria I saw very fine citrons weighing several pounds apiece, but those at Tripoli, in Syria, are still bigger, as big as ordinary melons, so that I dare not state their weight since it would sound incredible" (*Reyse vanden eerw.* Pater P. A. Gonsales, *Minder-Broeder Recollect.* (Antwerp, 1673), vol. 2, pp. 372–373.
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34. See, for example, Athenaeus, *The Deipnosophists or the Banquet of the Learned*, C. D. Younge, trans. (London, 1854), vol. 3, pp. 141–142.
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CURRENT PROBLEMS IN RESEARCH

Reappraisal of the Soil

Pedogenesis consists of transactions in matter and energy between the soil and its surroundings.

C. C. Nikiforoff

What is soil? Soil technologists and agronomists define soil as the medium which provides the foothold and the mineral nutrients for land vegetation. Agronomy inherited this old concept of soil from the tillers of land, for whom the soil is just the "dirt" supporting their crops. This simple utilitarian concept of soil is so deeply entrenched in people's minds that one may wonder whether it would not be less confusing to leave the term *soil* entirely to agronomy and coin some other name for the geochemical surface formation which is referred to in agronomy as "the soil."

Without agronomic bias, the soil or its geochemical equivalent might be defined as an excited skin of the subaerial part of the earth's crust. In order to clarify this definition it is necessary to define *earth's crust* and to say a few words about the nature of the excitation of its integument.

The author is a retired soil scientist with the U.S. Department of Agriculture.

Earth's Crust

The term *earth's crust* is intended to designate the 10-mile-thick outermost layer of the silicate geochemical shell. This shell, the probable thickness of which is in the neighborhood of 100 kilometers, consists of igneous rocks and their derivatives. Igneous rocks are largely made up of oxygen, silicon, and a half-dozen other elements, including aluminum, iron, calcium, potassium, sodium, and magnesium. These eight elements make up more than 98 percent of the mass of igneous rocks. Less than 2 percent of the shell is made up of other elements, the contents of which range from several tenths of one percent (for titanium) to mere traces.

Oxygen makes up only a little less than half of the whole mass of the shell, but, because its density is low, it constitutes by volume more than 90 percent of the bulk. Silicon is the next most abundant element in the earth's crust. It makes up about 27 percent, by weight, of igneous rocks (*1*). The density of silicon, however, is much higher than that of oxygen; hence, in igneous rocks silicon constitutes less than 1 percent of the volume. Aluminum and iron are the only other elements each of which makes up more than 5 percent of the mass of the earth's crust (*1*).

On the average, there are about 63 atoms of oxygen in every 100 atoms making up the earth's crust. All the oxygen is combined with other elements to form various oxides, which are arranged into crystalline lattices of rock-forming minerals, such as quartz, feldspars, and pyroxenes.

Crystals of silicates, which make up more than 90 percent of the mass of igneous rocks (*1*), are essentially oriented clusters of large oxygen ions, thoroughly interbraced by the much smaller ions of silicon and aluminum and holding ions of other elements in the interstices of the

BÉLA GUNDA

GYPSY MEDICAL FOLKLORE IN HUNGARY

GYPSY FOLKLORE in Hungary today is extraordinarily rich, despite changes in the Gypsies' mode of life. As a preface to my discussion of their medical folklore, I should like to deal briefly with the Gypsies' way of life.[1] In Hungary today one cannot see Gypsies living in tents and wandering about the country, but in neighboring Roumania one may see many nomadic Gypsies.[2] The Gypsies in Hungary have given up their roving existence, and an increasing number of them are engaged in farming or work in industrial plants and factories. More recently many of them have been employed by farmers' cooperatives and state farms, where they build adobes during the spring and summer months. Gypsies do not like to work in the mines, and for that reason they will seek work there for short periods of time only.

Acculturation does not occur under the same conditions and forms everywhere, of course. Near Sárospatak, the famous town of schools, in Borsod-Abauj-Zemplén county, is the village of Makkoshotyka. The Gypsies who live there engage in primitive hoe cultivation; they raise maize and potatoes and keep a few goats and cows, although pigs are rarely seen. They are excellent workers in the vineyards, and are gladly employed by Hungarian farmers to do hoeing. But in Szabolcs-Szatmár county the Gypsies, although they are settled, live wholly parasitic lives. In the village of Panyola I often saw Gypsies who sat begging for alms the entire day.

In the village of Csobánka, near Budapest, Gypsies are employed making iron nails. Here acculturation appears both socially and economically. Socially, it is manifested in the fact that Gypsy men live in concubinage with Hungarian women and vice versa. Economically, acculturation is apparent in the fact that many Gypsies who make iron nails have given up the tradition of independent work and have allied themselves in producers' cooperatives.[3]

The acculturation of the Gypsies in Hungary began long ago. It was reported in 1827 that Gypsies living in Nógrádveröcze, a small village north of Budapest, were working in vineyards and in the woods, and that they farmed and hoed with the Hungarian peasants; Gypsy girls were employed as maids in gentry and peasant houses.[4] In the middle of the last century it was observed that Gypsies living in several villages of Bereg and Szatmár counties began farming.[5] In 1857 schools for Gypsies were founded in Hungary by a Hungarian Catholic bishop. At the end of the last century Archduke Joseph Habsburg tried to settle the Gypsies into a civilized way of living.[6] His attempts failed, but he was greatly honored by the Gypsies, who came to see him from remote territories, and created many sagas about him.[7] In spite of the fact that many changes are continually taking place in the Gypsies' way of life, the ethnologist may still find many traditional aspects in their culture.

The Gypsies among whom I did fieldwork were partly Hungarian and partly Roumanian. The native language of the Hungarian Gypsies is Gypsy, but they also speak Hungarian, whereas the Roumanian Gypsies speak Roumanian and Hungarian well, but have a poor command of the Gypsy language. They wandered from Roumania to Hungary after having assimilated the Roumanian language at the ex-

pense of their native Gypsy. Gypsies speaking Roumanian can also be found in Somogy and Baranya counties in western Hungary.

The Hungarian Gypsies make adobes and work in iron, repairing iron pots. The Gypsies among whom my research was done live in the towns and villages of Hajdu-Bihar and Szabolcs-Szatmár counties. The Roumanian Gypsies among whom I worked live in the village of Panyola in Szabolcs-Szatmár county. Their principal industry is the making of baking troughs, which they manufacture from groves of poplar trees that they buy each summer. The carving is usually done in the woods where the trees are growing.[8]

Both Hungarian and Roumanian Gypsies live in Panyola, but their houses stand in different groups. So-called Russian Gypsies also live there, and are said to be primitive, untrustworthy, and mentally inferior. Their material culture is poor, and they live a parasitic life. In contrast, the Hungarian and Roumanian Gypsies are intelligent and well-informed on current world events. Politically they consider only their own interests. When I asked a Gypsy of Debrecen what their political outlook resembled, he replied, "We are guzzle-guts," meaning that they are concerned only with their own subsistence, and not with politics.

During my studies of the Gypsies it occurred to me that they still adhere to traditional methods of folk medicine. They believe that illnesses are caused by evil spirits, called *beng* or *bižuže*. These spirits may appear in the form of a horse, a hare, a donkey, a dog, a headless chimney cleaner, a giant, or a shepherd. One is lured and crushed by bad spirits, and it is said of an ill man that the *bižuže* trod on him; he was saddled by a bad spirit. When this happens a man feels depressed and shattered. According to Gypsy folk belief, a sick man will put on wide white linen trousers and fall asleep; then the bad spirit will leave him (D, HG).[9] Another method of protection is for the Gypsy to draw a circle on the ground with a stick, and to place a cross within the circle. The Gypsy who stands in the circle will not be harmed by bad spirits and ghosts (K, HG). Evil spirits and malevolent persons can be especially harmful if they obtain a piece of their victim's hair. The hair will be put under the threshold of his own house, or the lock of hair will be put in a pot and boiled. In this way the victim is bewitched (D, HG).

The Hungarian Gypsies of Debrecen tell of a woman who had a mustache. This woman picked up the layer of dust in which a man's footprints were found, put the dust in a pot, and took it to a crossroads. Here she heated the pot until the contents were boiling, and the young man whose footprints were boiled became very ill.

A young man can be bewitched if his footcloth and the strings of his wide white linen trousers are put into a new earthen pot and boiled over the fire. The young man whose footcloth and trousers strings are boiled will love the girl who is chosen to be his wife.

Gyula Balogh, a sixty-six-year-old Hungarian Gypsy of Debrecen, told me an interesting story based on his own experience with a *beng* who appeared in the form of a shepherd. When Gyula Balogh was younger, he worked with an old Gypsy in a village on the estate of a count. One evening about eight o'clock, as they were talking, a shepherd came to them. Gyula Balogh's friend asked the shepherd for a dottle, and the shepherd silently took a large pipe out of his pocket and shook out the dottle. Instead of giving the old Gypsy the dottle, the shepherd moved farther away, luring the Gypsy with him to a large meadow. When the Gypsy returned the next morning, he was very ill.

Sickness can also be caused by midwives who have bewitching power. In a story told by the Hungarian Gypsies of Debrecen, a midwife had a cow which died. She buried it in the cemetery and had a wooden grave post made for it. At that time some grinder Gypsies appeared in the village and were given lodgings by the midwife. Learning from her that her cow had recently died, the Gypsies went into the cemetery and dug up the carcass. One of the Gypsies cut a piece of the carcass, and in touching it he became crippled. For the next four or five years he was carried around in a handbarrow, and after some years he was brought back to the midwife, who was asked to do something with the ill man. The midwife spat at the crippled man, who then got off the handbarrow and walked as though he had never been ill.

A person may also become ill from sitting on a place that has been bewitched by bad spirits or by malevolent people (P, RG). There are different ways of keeping away the bad spirits and evil ghosts. Generally the custom is to keep a broom beside the door every night so that the evil spirit may not enter the house (Krs, HG). If there is an illness in the house of a Hungarian Gypsy, a blade of the millet broom will be pulled out and put into the keyhole in the evening. At night a wooden spoon will be placed under the pillow of the ill man. If a dog is howling with its nose down, it means that one of the Gypsies is going to die; but if it howls with its nose up, a conflagration is going to occur. Both disasters are felt by the dog nine days before they are about to happen. The old Gypsies think that the dead man's spirit cannot rest if the dog is spoken to, and the dead man's spirit is kept away by splitting the deceased's shirt.

The custom of name magic is also connected with illness among the Gypsies. According to the folk belief of the Gypsies a "changing" occurs in the life of a seven-to-eight-month or one-year-old child. (D, HG) The child foams at the mouth, struggles, and feels dizzy. (P, HG) The Hungarian Gypsies of Debrecen describe this sickness in the child as being similar to heart trouble, and the child will stiffen. The sickness may be caused by the growing of an eye tooth or by fright caused by a cat or dog. In a similar way, the Roumanian Gypsies believe that the child catches the illness, or "changing," if one of his parents swears a false oath.

If the "changing" befalls a child in Kérsemlyén, in Szabolcs-Szatmár county, the mother tears off the child's clothing, burns it, and gives the child another Christian name. In Panyola, the Hungarian Gypsy mother of a suffering child will take off his clothing and either bury it under the threshold or throw it over the roof of the house; then in thought she will give the child another name. Among the Hungarian Gypsies of Debrecen there are other customs followed on the occasion of "changing." The clothing of the sick child is taken off and thrown over his head. The clothing is then burned and the ashes buried; at the same time the mother changes the name of the child "with one thought." For example, if the girl's name was Ribizla, she will receive the name of Pisoma after the magic act. In addition, the girl has a third Christian name, Helen, which is the girl's legal Christian name. She receives this name from the priest of the local church at the time of her christening, and under this name she is registered by the registrar. Another custom is that the clothing is torn and cut off the child with a scissors. It is then boiled in a new pot and thrown over the roof of the house. On a Tuesday, Friday, or Saturday the clothing will be buried in a crossroad, along with the pot and the water. According to the folk belief of the Gypsies, the person who takes away the clothing and pot will catch the sickness as well.

After the mother cuts off the child's clothing and he stands naked before her, she gives him a new name. The new name is always chosen for the child by the mother. During the magic act the mother thinks of a name, and from that time on the child is called by that name by his family, relations, and acquaintances. It is the belief of the Gypsies that when a child changes names he becomes another person, and this deceives demons and hides the person from bad spirits and harmful powers.

The custom of changing names is known in several variations in Europe. Usually the child is not called by its own name before christening. Thus, in order to mislead the bad spirits, the Roumanian child is not called by name, but is called *Turc* (Turk).[10] Among the Bulgarians the following names are attached to small children until the christening: Doggie, Little Undressed, Made of Iron, or Snail.[11] In Carinthia the name of the child is kept secret until the christening, and the child is called by several funny names: Falott, Perl, Rabenvieh, Jud, Heid, Weible, Kind.[12] Among the roving Gypsies in southern Hungary,[13] some Hungarian ethnic groups,[14] the Laplanders, the Mongolians,[15] the Serbians, and the Jews in Poland and southern Russia,[16] the name of an ill person is changed.

It is interesting to note that the alteration of names was also prevalent among the dynasties in general. When the Persian Shah Sephi (1667-94) was very ill, he was crowned again and his name was changed. He was then called Soliman or Selim instead of Sephi.[17] In China, around 1878 when there was a period of famine, the emperor altered his own name because he thought that by doing this the starvation might be stopped.[18] I had these examples in mind when I told a seventy-year-old Hungarian Gypsy woman of Debrecen, Piroska Lakatos, that in the olden times rulers, kings, and emperors changed their names. "They must have been Gypsies too!" stated the Gypsy woman very seriously. Her statement was made as firmly as that of a world historian.

Sickness and even death may be caused by fasting, and there are many variations of fasting known among the Gypsies. If a Hungarian Gypsy in Mátészalka, in Szabolcs-Szatmár county, becomes angry with somebody, he will keep a fast on nine consecutive Fridays or Tuesdays. While he is fasting he thinks of his enemy, and this will bring sickness to the enemy. In Panyola the fasting Gypsy gets up early on the above mentioned days and sits for an hour without speaking. The person who has stolen something from the Gypsy, or who has annoyed him, will become blind or lame according to the wish of the fasting Gypsy.

In the belief of the Roumanian Gypsies in Panyola fasting may be carried out by the Gypsy's kneeling on maize and praying in a loft for nine consecutive days and nights, with a burning candle before him. The victim toward whom the fasting is directed will die or "the strength will be taken" out of his feet.

The next example of fasting, from the Hungarian Gypsies of Debrecen, is reminiscent of the ceremony of primitive medicine men. The fasting person keeps his fast every Tuesday, Friday, and Saturday, or possibly only on Friday, for six weeks. This type of fasting is practiced mostly by women. In the evenings of the fasting days she wears a black headsquare, burns two candles, and takes out salt and lard which she spits bit by bit into the fire, scolding the person who has harmed her. The following abusing words are said by the fasting Gypsy woman: "As much salt as was thrown by me on the fire, so may pimples arise on the body of so and so!" "As the lard burns on the fire, thus pimples may grow on the body of so and so!" Then she kneels down and takes off the headsquare, striking the ground with it and saying:

"May my curse meet him!" "The trouble shall not leave the person if I do not put my hand on him ten times!" The Gypsies of Debrecen believe that this will cause the victim to be crippled, or to have skin disease or pimples on his face and body. This method of bewitching is generally used by the Hungarians in the Great Hungarian Plains area, and in Transylvania by the Roumanians;[19] the same custom is also found among several German ethnic groups.[20] From a Transylvanian-Hungarian analogy we understand the significance of using a candle. The fasting person in Transylvania in the valley of the brook Borsa says the following sentences while kneeling between two candles: "He [the person toward whom the fasting is directed] may decrease out of the world as this candle is decreasing!" In other words, as the candle decreases from burning, so shall the victim become ill and suffer.

It is very interesting that the directed fasting occurs also in a novel, *Az Igazi,* of a great Hungarian writer, Alexander Márai. A maid servant who has fallen in love with her young master fasts in order to bewitch him into returning her love.

I mentioned above that the fasting woman says while fasting: "The trouble may not leave the person if I do not put my hand on him ten times!" These words preserve the ancient custom of curing by the putting on of hands. In the old days kings and rulers cured by touching the sick with their hands or fingers. According to Pliny the thumb of the king of Epirus, Pyrrhus, had the ability to heal those suffering from kidney disease by touching them on the back. When the king's body was burned, the wonder-working thumb was left unharmed and was preserved as a relic in the Zeus church of Dodona. Among the Hungarians the ring finger is called the "medical finger," meaning that it was used for healing.

In England, the laying on of hands was fashionable mainly during the reign of Charles II (1660-85). The ceremony was carried out as follows: The sick person was led before the king by the surgeon; the sufferer knelt before the king's throne, and the king struck him on both cheeks with both hands. At the same time a clergyman standing beside the king said, "He put his hands upon them and he healed them." It is said that Charles II touched nearly one hundred thousand people during his twenty-two years' rule. When Waldeman I, king of Denmark from 1131 to 1182, went to Germany, the women brought their children and the men their seed corn for him to touch with his hand.[21] More examples could be quoted, but it is now evident that this way of healing which was exercised by rulers during the last centuries lives on among the Gypsies of our day.

In eastern Hungary the curing of sick Gypsy babies is called "measuring." If a child between the ages of one and three years is sick, he is laid on his back; then his left elbow is touched by his right knee, and vice versa. If the elbow meets the knee, the child is not ill; but if he cries then he is ill. The woman who does the measuring spits three times beside the child and says, "Jesus Christ, help me!" It is difficult to determine for which sickness "measuring" is done by the Gypsies. It is generally said that the child is measured if his rump bone (coccyx) is twisted. "Measuring" often is used to denote the diagnosis and the healing of the sickness. However, the elbow and knee of the little child are touched only for diagnosis. The healing itself is done by smearing the child's posterior with slobbery fingers. Then he is held by his feet, head down, and pulled on three times. Afterwards, the woman carrying out the "measuring" lays the child on his back with his arms outstretched, and taking his right arm, pulls him over on his left side and lower left arm three times. One very often meets several forms of "measuring" in the ethnic healing groups of Europe. It occurs with

remarkable frequency among several German ethnic groups.[22]

In the town of Hajdubőszörmény, in Hajdu-Bihar county, the Hungarian Gypsies believe that a man or woman whose eyebrows meet can cast an evil eye on children. If such a person looks at a child, he will cry, become ill, and refuse to eat. To guard against the evil eye a red ribbon is tied around the arm of the child. If the child should be bewitched, however, he is cured by the following method. The woman treating the child throws nine pieces of glowing coal into a pot filled with water. As she does this she names nine people who are suspected of making the child ill, saying "Mary cast an evil eye on the child. Stephen cast an evil eye on the child. John cast an evil eye on the child. Peter cast an evil eye on the child. Elisabeth cast an evil eye on the child. Eva cast an evil eye on the child. Francis cast an evil eye on the child. Katharine cast an evil eye on the child. Alexander cast an evil eye on the child." The ember of the person who has cast an evil eye on the child will sink to the bottom of the pot. The medicine woman then dips her finger into the pot nine times, dripping the water from her finger into the child's mouth each time. The remaining water is poured under a tree or under the eaves.

In Debrecen, among the Hungarian Gypsies, if a mother suspects that her child has been bewitched by an evil eye, she makes a fire. Taking nine coals from the fire, she puts them in a cup of water. If the coals sink to the bottom of the cup, the child has been bewitched by an evil eye, but the mother does not try to find the bewitcher. Instead, she dips her left hand into the water and washes the child's face with the back of her hand. Then she wipes the child's face with the inner part of her skirt, saying "Help, Jesus Christ!" She then pours the rest of the water on a dog or cat, or on the corner of a door.

When it thunders for the first time in the spring, a Gypsy strikes his head with a stone or hits his head against a wall to guard against headaches (P, D, HG). If a Gypsy's enemy cuts a lock of his hair unobserved and throws it under a millstone, the Gypsy will be very ill, and his head will "move like a millstone" (Krs, HG). Headaches are cured by putting a dressing of salted, uncooked potatoes in the form of a ring on the forehead (P, HG). A person suffering from sunstroke goes to the creek before sunrise and throws a little water over his head with his right hand, saying, "What is in my head should be at the bottom of the water!" (D, HG).

When a Hungarian Gypsy in Debrecen has an aching tooth, he rubs it with a coin and then throws the coin away. The belief is that the person finding the money will inherit the toothache. It is generally the custom among the Gypsies of eastern Hungary to put a quid on the aching tooth.

A sore mouth or a tongue covered with blisters is healed by bewitching dolls. The Hungarian Gypsies of Debrecen make these dolls by rolling a rag around nine twigs, which are tied in the form of a star (Fig. 1). The medicine woman surrounds the sore mouth with the bewitching dolls and says, "It [the sickness] shall remain in the grass and the tree!" After having done this she spits to the right and the left three times and takes the dolls to a crossroads, so that the mouth wounds may be caught by cattle or people passing the spot. On her way home she must not look back. The most suitable day to carry out the witchcraft is Friday, and each of the dolls must be given a special name. The names are ones of relation, such as father, mother, son, daughter, grandmother, grandfather, godfather; the Gypsies believe that a *family* is formed by the nine dolls.

In Kovácsvágás, Borsod-Abauj-Zemplén county, the bewitching dolls are not tied

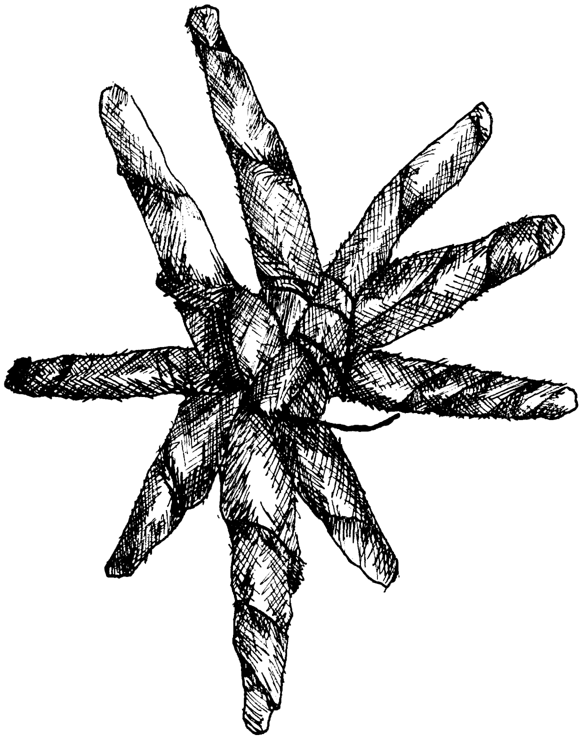

Fig. 1

together in the form of a star, but stand separately and have the form of a man. The sore mouth or tongue is surrounded by each doll three times, and these magic words are said: "It is not nine, it is not eight, it is not seven, it is not six, it is not five, it is not four, it is not three, it is not two, it is not one." After the magic act has been carried out, the dolls are thrown in a creek to be carried away by the water, or they are stuck head down in a dunghill.

In Kérsemlyén a similar method of healing sore mouths is used. The wound is surrounded by the nine dolls in the form of a man, and the Hungarian Gypsy medicine woman spits on the ground beside the ill person and says, "Go astray!" (meaning that the sickness should go away or vanish). Then she goes to the crossroads and throws the dolls among the pigs or cows passing there. On this trip she may not greet anyone or return any greetings, nor may she look back as she returns to the village. (The nine separate dolls in the form of men, which are used for healing sore mouths, are shown in Fig. 2, drawn from those seen in Szamosszeg, in Szabolcs-Szatmár county.)

There are several ways used by the Gypsies to cure sore throats. First, the lard of a bullfrog is rendered and smeared on the throat. The rest of the grease is poured on the crossroad, on a Friday or Saturday night, where nine dead persons are lying. In another method, if a Gypsy catches a lizard before Good Friday, he strokes the lizard's throat with his fingers and then strokes his sore throat with the same fingers. He may also rub the lizard on his sore throat, according to the Hungarian Gypsies of Debrecen. In Kérsemlyén the Hungarian Gypsies rub a tree frog on the sore throat.

A person having a heart disease can be healed either by a piece of wooden grave post or by a winding sheet, if he should collapse from his illness. A piece of an old

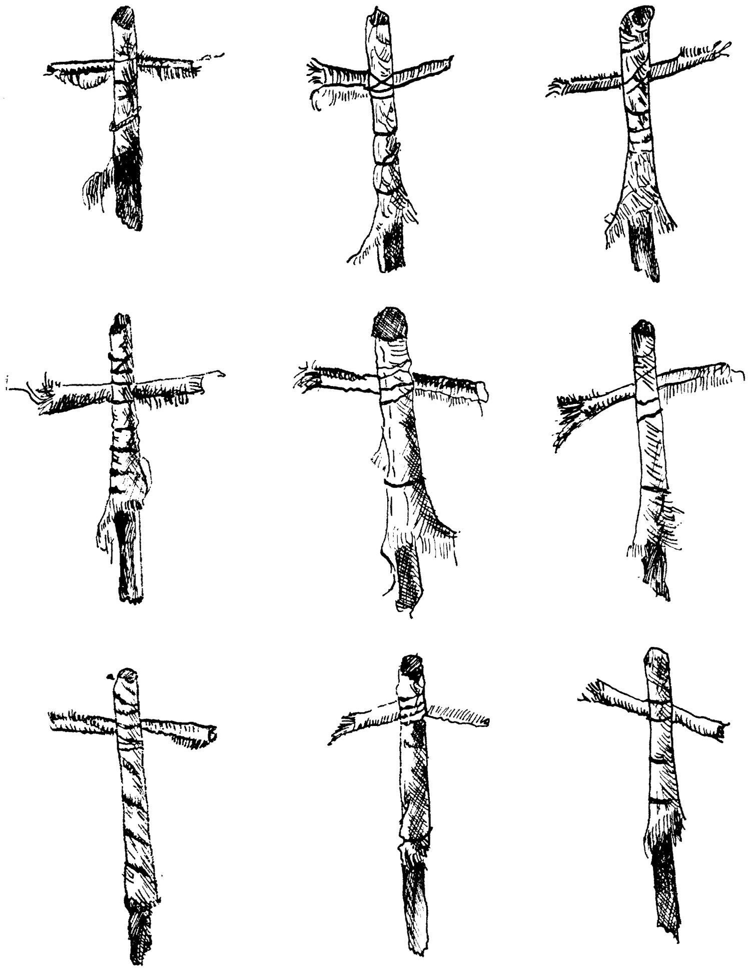

Fig. 2

wooden grave post or of a winding sheet is brought and smoked under his nose. This custom is followed by the Hungarian Gypsies of Debrecen.

A person having a shooting pain in his stomach lies down on a cross-shaped molehill three times, while pressing his navel with his forefinger. The healing of stomach-aches and pains is done by having the sick person lie on the ground. A freshly dug potato on which there is a rag smeared with grease is placed on his abdomen. The rag is then lit, and its burning resembles a primitive lamp. This is quickly covered by a mug, under which a vacuum arises, and the mug sticks to the abdomen of the ill person (Fig. 3). The Gypsies of Hajdu-Bihar and Szabolcs-Szatmár counties believe that the suction caused when the mug covers the flame will "pull out the aches."

A Gypsy may catch jaundice if he eats too much lard, if he steps on an eggshell, or if he walks in the trace of a hearse. He may also catch jaundice by looking through the window of a house in which a dead man is lying. However, if a man washes himself in the morning, he will be able to walk in the trace of a hearse or look in the window of a house in which there is mourning without becoming ill. Jaundice can

be cured by taking the dust out of nine footprints at the crossroads and from nine graves and mixing it in water, which is given to the sick person to drink (Krs, HG). The ill person may also be made well by drinking brandy or water into which nine lice have been put, or by eating jam in which nine lice have been put. Another method of cure is that nine freshly killed, fried magpies are given to the sick person to eat (P, RG).

The shivers may be healed by writing on the door of the sick man's hut: "Leave this place now [evil spirit], the ill person is not at home!" The illiterate Gypsy draws a cross on the door and repeats the above words (Krs, HG). The Hungarian Gypsies of Mátészalka and Debrecen cure shivers by wearing amulets around their necks. In Mátészalka, a sick Gypsy makes the amulet by cutting his fingernails and toenails, pulling out three single hairs, and rolling these with a tree frog in a rag, which he wears around his neck for nine days. After this period the amulet is thrown back over his head. I asked Gypsies several times whether this method of cure was effective; both young and old swore that it was the best medicine for shivers. "Such a good medicine cannot be given even by the physicians at the clinics" was the answer. I informed them that they should answer me truthfully, since I intended to write about their mothod of treatment in an American newspaper. Béla Rostás, a sixty-nine-year-old Gypsy of Debrecen, answered: "This is a medicine that can be used also there. You shall tell them! They will surely praise us also in America. . . ."

There are several methods of curing warts (*verruca vulgaris*) which develop on the hands. The wart will disappear if it is rubbed with a dried frog or with the tail of a lizard, or if it is smeared with the fresh blood of a mole or frog. The wart may also be smeared with a bacon rind, but then the rind must be dug into the earth under the eaves. By the time the rind has rotted, the wart will have disappeared from the hand. Another useful medicine in the curing of warts is stolen leaven, which is

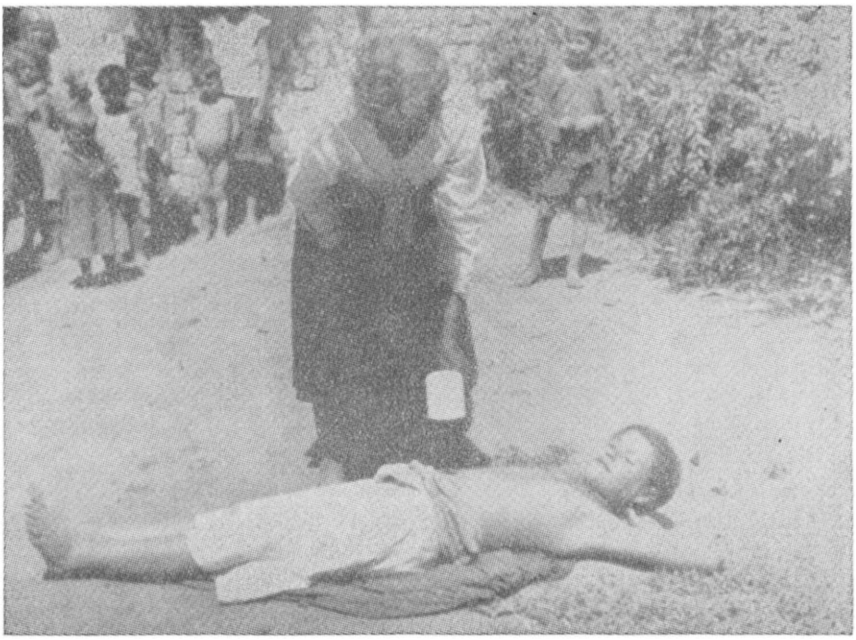

Fig. 3

placed around the wart; afterwards the leaven must be secretly returned. A single hair from the mane or tail of a horse can be tied around the wart, and it will disappear in a week. All these curing methods are generally known among the Gypsies living in Hajdu-Bihar and Szabolcs-Szatmár counties. According to the Gypsies of Panyola, there is a Hungarian in the village who looks at the warts and says, "Now you can go away!"—and the wart disappears in a few days.

The Gypsies are very much afraid of being bitten by a mad dog. The bite or wound is usually healed by slaying the dog, burning a bunch of its hair, and putting the ashes on the wound. Usually split beans are applied along with the ashes. The bite of a mad dog can also be healed by having the victim drink water or brandy in which nine headless ashflies have been put. These curing methods are known and used by the Gypsies in the eastern part of Hungary.

The practice of using ashflies against madness is very old; its application was known to the Arabian physicians. In Hungary ashflies were recommended by a noblewoman in 1570 for the curing of madness. Dr. Spilenberger, a physician in Löcse, Szepes county, reported in 1670 that in the eastern part of the Great Hungarian Plain a new sickness like madness was discovered. It was treated by the application of ten ashflies, which were consumed by each victim, the result of which was heavy sweating and urination. He did not advise the same cure to Germans or other people because only the strong constitution of the Hungarians could bear it.[23]

If a man or woman has sore eyes, he ties a white headsquare on his head, and this heals the person. A person wishing to blind someone steals a single hair from his victim and uses it to sew together the eyes of a frog. The frog is then buried under the threshold on a Friday. The Gypsies do not believe that the frog will die if buried; thus to restore the blinded man's eyesight the person who carried out the magic act can dig up the frog (Krs, HG). A person having a sty (Hungarian: *árpa* 'barley') on his eye can cure it by covering the eye with his hands, in which he is holding barley. He then walks around a well nine times, and afterwards throws the barley in the well. It is also a custom for the sick person to surround his eye four times with the corners of a pillow, after which he spits on the ground (D, HG). The same method of curing is also known in the village of Kérsemlyén, but here the following words are said after the magic act: "Barley, barley, I shall mow you!" In Hajdu-böszörmény, in Hajdu-Bihar county, the act is varied by the Gypsy saying, "Barley, barley, I shall mow you! If you do not leave my eye, I shall put you into the vagina of a white horse!" as he goes around the well three times. After he has said this, he throws the barley in the well and crosses himself.

If a person has a sore ear, he picks the offending member with a splinter from a tree struck by lightning; this will heal the ear (Krs, HG). For this reason trees struck by lightning are not cut down. Elderly Gypsy men can be seen today wearing earrings or eardrops in their right or left ears (Fig. 4). This is done to protect them from eye pains and deafness. Eardrops prevent sickness and also heal sore eyes and ears. The earring can be made of copper, silver, or gold, according to "which is most suitable for the ear." Before a woman perforates the ear of a man, she rubs it with nettle to numb it so that it will not hurt. This is a general custom among the Gypsies living in the eastern part of the Great Hungarian Plain. It is also known among the Gypsies living in another part of Hungary and in Czechoslovakia.

We often see eardrops in the ears of poor people wandering around the country, and among beggars, grinders, stall keepers, and acrobats. In ancient times there were

writers, artists, and politicians who wore earrings in one ear. Oswald von Wolkenstein, John Sobieski, King of Poland (as shown in a painting by Rembrandt), the composer Wolfgang Amadeus Mozart, and others wore an eardrop. Later this custom was limited to wanderers, vagabonds, and peddlers.[24] The works of reference in western Europe also report that men are protected by eardrops against eye disease and deafness. In the northern part of Transylvania I often saw small wooden sticks worn in place of metal earrings by Roumanian shepherds, who used them to ward off headaches.

It is interesting to note that some animals play a great role in Gypsy medical treatment. In Kérsemlyén the bristles of the hedgehog (*Erinaceus europaeus L.*) are cut and burned; the smoke is inhaled by a Gypsy having a cold. In Mátészalka, the Hungarian Gypsies heal wounds by putting the ashes of the burned bristles on them. Hedgehog grease is often smeared on parts of the body afflicted by rheumatism. Sometimes the afflicted area is smeared with the urine of a hedgehog, or with the grease of a gopher (*Spermophilus citeleus L.*). It is believed in Panyola that only the rendered grease of a hedgehog caught before St. George's Day, 24 April, is useful.

In medical folklore the snake also plays a great role. A Gypsy of Füzesabony, in Borsod-Abauj-Zemplén county, told me that in the spring more than one hundred snakes will gather together and blow foam out of their mouths. The foam becomes

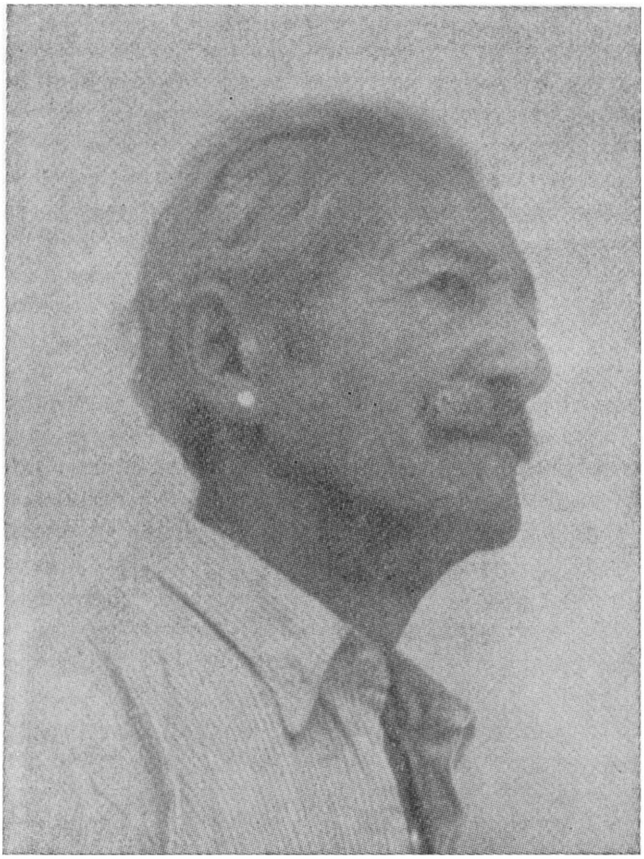

Fig. 4

stone, the so-called *serpentine*. While this act is taking place the snake king, which has a red and blue comb, watches and then takes the serpentine with its tail and drags it into a hole. A man having a cataract must sew the serpentine into an amulet and wear it around his neck to heal his eye. The Hungarians have seemingly known of the powers of serpentine for a long time. A testament from the beginning of the seventeenth century says that drinking from the serpentine will heal many kinds of throat aches. When the snakes are in the act of blowing the serpentine, one must throw a white kerchief over them and trundle a wheel among them; this will cause them to leave the stone. Because it brings luck, serpentine is carried by all Hungarians who search for hidden treasure. Similarly, a person carrying serpentine in his purse will never be short of money. Several beliefs referring to serpentine are known among the Slovaks, Lapps, and Germans. The roots of this belief can most likely be traced from India.[25]

As the grease of the hedgehog is useful in treating rheumatism, so is the grease of the snake. The Gypsies believe that a snake gets into a sleeping man and can be removed only by hanging the man by his feet with a pan full of milk under him. If a snake bites a man's foot, he must be buried from his waist down in the ground for twenty-four hours; this is to prevent spreading of the snake's venom (D, P, Krs, HG).

We may find relics of the "head-cult" among the Gypsies. The Hungarian Gypsies of Debrecen take home skulls from old cemeteries. If there is a person in the village who has a crippled limb, the skull is filled with water and allowed to stand for two weeks. At the end of this time the crippled man drinks some of the water from the skull; the rest he rubs on the crippled limb. The lameness then disappears, according to Gypsy belief. The Hungarian Gypsies of Kérsemlyén think that the same method of curing is successful against all diseases.

A skull ground to powder and drunk in water, wine, or brandy is used against different illnesses (D, HG). A frightened child eats it in jam or drinks it in water to rid himself of fear or dread. The most suitable day for drinking this mixture is Thursday (Krs, HG). A thirty-year-old Gypsy, Aladár Csercse, gave me a very interesting description of the healing powers of the skull. I publish it word for word.

> When we were children and someone was frightened by his dream and woke up, mother took the skull kept in the hut [and] after grinding a piece of it to powder she threw it into [some] water. He who was frightened had to drink from the water three times. At the same time she said a prayer. Then she fumed the four inner corners of the house with incense. A small bag containing incense powder was tied around the neck of the frightened child by its strings; there were three knots on the strings. The child had to wear it three times nine days.

There are many superstitions attached to the expectant mother and the newborn child. These superstitions serve the aim of promoting the health of the mother and little child. The expectant mother must not eat onions; otherwise her child will have boils (P, HG). It is not advisable that the expectant mother eat adherent double fruits, such as plums or potatoes, because she may then expect twins (P, D, HG). If apples or plums are thrown to the expectant mother, the child will have birthmarks on its skin, which will appear on the body of the child during the month in which the fruit was thrown at the mother. In other months the birthmark may disappear from the child's body (D, HG). If the expectant mother wants something and her wish is not fulfilled, she puts the thumb of her right or left hand to the waistband of her skirt; if she does not do this, her baby will not be born (D, HG). The pregnant

woman must not kick a dog or cat, for if she does the child's mouth will be hairy (D, HG). An expectant mother may not step over a rope or a child's dress; otherwise her baby will come into the world in a caul (D, HG). An interesting bit of sorcery can be carried out by the Gypsy woman who is in her first pregnancy. If she ties nine knots in her hair while it is raining, the rain will abate. Likewise the rain stops and the rainclouds pass over if she draws a cross on the ground and sticks a knife in the cross (D, HG).

An old woman usually lends a helping hand during the birth of the child. If the woman has great pains, the old woman says the magic words which follow:

> Nineteen is the *beng!*
> Nineteen is the travelling scholar!
> Nineteen is the scholar!
> They shall rejoice that she may bear this boy easily!
> May God give so!

A knife is placed, point up, at the feet of the woman in childbirth, so that the evil spirits may not take away the mother's milk or cause harm to the child (D, HG). Also, a comb and a piece of bread are put under the woman's pillow so that the *beng* may not steal her child (D, HG). It is also the custom to put salt, bread, and a fiber from a broom into the swathing bands under the head of a baby so that the evil spirits cannot steal the child or exchange it (D, HG). The Gypsies of Hajdu-böszörmény believe that the evil-minded midwives exchange the child. For this reason the old men of the village place a broom, handle down, beside the door of the hut in which a child has been born. Nine grains of salt are sprinkled among the fibers of the broom to prevent the exchange of the child. Among the Hungarian Gypsies of Kérsemlyén a comb and scissors are put under the head of the child, and it is laid inside beside the wall. Before falling asleep the mother spits on it three times and says, "Kill it [i.e., the evil spirit], Holy Ghost!" Then she wipes the forehead of the child with the lower edge of her skirt.

The *beng,* midwife, or evil spirit can only steal the child before it has been christened. The child left in exchange is ugly, has a large head, does not grow, and "has no bones." According to the belief of the Gypsies of Kérsemlyén, the exchanged child will be brought back by the *beng* if the mother heats an oven and pretends to prepare the *beng*'s child for cooking. The mother places the child on a peel and says, "If you took away my child, I burn yours!" This causes the evil spirit to appear. When this magic act was done by a Hungarian Gypsy woman, according to a story, the *beng* appeared and said to the woman, "I take the bones out of your feet!" This was done, and the woman became crippled. Later, the *beng* wanted to give the woman back her health and called her to the crossroads. The woman crept there with great difficulty, drew a circle in the dust, and sat down in the middle of it. While she was sitting there somebody shook her suddenly, and she instantly became healthy.

According to Gypsy tradition it is common to take the changed child into a plowed field and leave it in a furrow. The bad spirit will then bring back the mother's child and take its own child from the furrow (P, HG). There are also Gypsy women who can tell by its age if a suckling is an exchanged child or not. The women will say to a mother, "This is not your child!" if the child has been changed (P, HG).

There are other superstitions connected with pregnancy, childbirth, and newborn babies. A woman who is in her menstrual period must not look at a newborn child;

otherwise the baby will develop eczema. A mother must be very careful that the bad spirits or some ill-willed woman do not take away the milk in her breasts. Also, if a pregnant woman sits on the bed of a nursing woman, the latter may cease to have milk. The nursing mother may bring back her milk by the magic act of tying a tape, which her husband uses to fasten his pants, around her breast. Another way of getting back the milk is for the nursing mother to steal a piece of this tape from the husband of the woman who caused the milk to cease (D, HG). If the tape is put in the bed of the nursing woman, nobody can take away the milk (D, HG). If the naval cord of the newborn baby dries, it is sewn into a small bag and hung around the baby's neck. The person wears this amulet until old age, since it brings luck to the wearer (D, Krs, HG).

Above I have given some particulars about the medical folklore of the Gypsies living in the eastern part of the Great Hungarian Plain. Their traditions are, of course, not present in each family in the same way. There are conservative and less conservative families and individuals. The latter group consists of the Gypsies who can read and write, who have served in the army, and whose experiences and outlook have been broadened by working in factories, plants, and on farms. The less conservative Gypsies are not devoted to the relics of their cultural tradition. If some of the curing methods are known to them, they have no function in their life; if some traditions have lost their function, they have no place in the structure of society any more. Many of the magic acts and healing methods live only in the memories of the older generations, and most of the relics of medical folklore are preserved by the women, rather than the men. A Gypsy woman who is going from house to house begging may offer some suggestion for curing any ill person in the house of a Hungarian farmer, but she may also ask the farmer's wife for advice in curing some sickness in her family. This advice does not refer to magic acts, sorceries, and the general sphere of magic, but rather to medicinal herbs and their application.

There are Gypsies who do not believe in some of the magic acts or traditional healing methods; they smile at them but resort to other methods of curing. Generally, I found that the most common practice of medical folklore is related to healing of children and the prevention of children's diseases. A mother will often take her sick child to the doctor and treat it at the same time with several magic acts. Grown-up people generally go to the doctor in the case of an illness; many Gypsies go particularly to the clinics of Debrecen University. Their greatest desire is that the doctor will take X-rays of them, since this symbolizes to them the highest form of medical science. They think that the doctor can see into their hearts, livers, or stomachs, and that he can see the sickness hiding in them. A Gypsy woman once asked a doctor to take an X-ray of her to see if her child had caught a disease from the mother. It is strange that an electrocardiograph is not appreciated by them; they think it is much more valuable if the doctor feels their pulse. No doubt they are impressed by the X-ray because it is taken in the dark. Esther Lakatos, a sixty-six-year-old Gypsy woman from Mátészalka, told me, "I felt as if I were in heaven when the radiography was taken." Gypsies do not take mineral baths at all, since they think that "only the rich people believe that the water has a curing effect" (Krs, HG).

The Gypsy likes the doctor to examine him thoroughly, but he does not take the advice of the doctor; they cannot do as he says because they live under very modest circumstances. They do not like to take medicine because they think all medicines are "bitter." The doctor will prescribe medicine, but the Gypsies will not buy it. If

they have been given some by the clinic and a bit remains after their illness has been cured, it is saved and lent to others suffering from the same symptoms. If a Gypsy feels the healing effect of a medicine, it will be used against all other diseases, as well as the one for which it was prescribed. They think little of injections, for they believe that most doctors "syringe only water into the ill." All Gypsies, young and old, are afraid of vaccinations ordered by the authorities. Most of them ran away from the vaccination ten or twelve years ago, but today they are generally more submissive.

When the Gypsies grow old they await death quietly. Old Gypsies try to save some money so that their families will not have the added expense of a funeral. Ill people are looked upon with a wise quietness; the other Gypsies feel sorry for them but do not bother them. An old person who is ill is rarely spoken to, and the only light food that is given him is tea. When I asked Béla Rostás, a sixty-nine-year-old Debrecen Gypsy, why he was going around in his hut with a high fever, and why he did not go to bed so the doctors would be able to heal him, he replied, "Now I am well. If I become worse I will go to the clinics . . . there are famous doctors there like in India or America . . . ." A Gypsy of Konyár, in Hajdu-Bihar county, replied to me when I began to inquire about the healing of jaundice, "The medicine for the jaundice is known only in the hospital, sir! How could a Gypsy know what the medicine is for jaundice; why do you ask us such things? We are no scientists!" These words of the Gypsies indicate that their traditional view and their concept of the world is being transformed. They look no longer at the traditions, but try to take notice of the achievements of civilization.

NOTES

1. I have given a short account about my research among Gypsies in my book entitled *Néprajzi gyüjtőuton* (*On Ethnological Fieldwork*) (Budapest, 1956), pp. 135-148; and in "Rostás Béla cigány mesemondó" ("Béla Rostás the Gypsy Tale-teller"), *Élet és Müvelődés,* I (Debrecen, 1959), 45-48.
2. I shall give a report in a later study about the tents of roving Roumanian Gypsies.
3. J. M. Ladvenicza, "A csobánkai cigányok szegkovácsolása" ("Nail-making by the Gypsies in Csobánka, County Pest, Hungary"), *Néprajzi Muzeum Értesitője,* XXXVII (Budapest, 1955), 227-241.
4. J. Karizsany, "Veröcze falu historiai, topographiai, és statisztikai leirása" (Historical, Topographical, and Statistical Description of the Village Verocze"), *Tudományos Gyüjtemény,* IX (Pest, 1827), 49.
5. P. Hunfalvy, *Magyarország ethnographiája* (*Ethnography of Hungary*) (Budapest, 1874), p. 516.
6. Erzherzog Josef, "Mitteilungen über die in Alcsuth angesiedelten Zeltzigeuner," *Ethnologische Mitteilungen aus Ungarn,* III (Budapest, 1894), 3-8.
7. A. Herrmann, "Zigeuner-Sagen udgl. über Erzherzog Josef," *Ethnologische Mitteilungen aus Ungarn,* III (Budapest, 1894), 112-114; 165; 204-205; 254-255.
8. B. Gunda, "Teknővájó cigány és munkája" ("Gypsy Carving a Bake Trough and His Work"), *Néprajzi Muzeum Értesitője,* XXVI (Budapest, 1934), 57-60.
9. I have given abbreviated references in brackets to the village, town, and the group of Gypsies where research was carried out by me: D = Debrecen, County Hajdu-Bihar; K = Kovácsvágás, County Borsod-Abauj-Zemplen; Krs = Kérsemlyén, County Szabolcs-Szatmár; P = Panyola, County Szabolcs-Szatmár; HG = Hungarian Gypsy; RG = Roumanian Gypsy.
10. J.-A. Candrea, *Folklorul medical român* (Bucharest, 1944), p. 261. In the book by this Roumanian author one may find full references to the matter. For the custom of the name-alteration, see further: J. G. Frazer, *Folklore in the Old Testament,* I (London, 1918), 236; Aly, "Namensänderung," in E. Hoffman-Krayer and H. Bächtold-Stäubli, *Handwörterbuch des deutschen Aberglaubens,* VI (Berlin-Leipzig, 1934-35), 963.
11. Candrea, p. 261.
12. Ibid.

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18. Ibid.

19. A. Vajkai, *Népi orvoslás a Borsa völgyében* (*Folk Healing in the Valley of Borsa*) (Kolozsvár, 1943), pp. 24-25.

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24. L. Schmidt, *Der Männerohrring im Volksschmuck und Volksglauben mit besonderer Berücksichtigung Österreichs* (Wien, 1947); L. Weiser-Aall, *Menn med Øreringer i Norge* (Oslo, 1957).

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Ethnological Institute
University of Debrecen
Debrecen, Hungary

LAKE VAN AND TURKISH KURDISTAN: A BOTANICAL JOURNEY

P. H. DAVIS

THE SOUTH-EAST corner of Turkey has always been one of the least known parts of Asia Minor; wild and mountainous, sharing a frontier with 'Iraq and Persia, it is both physically and politically difficult of access. But in the summer of 1954 permission was granted by the Turkish government for me to extend my botanical researches into that area. The small expedition was made under the auspices of Edinburgh University. I was accompanied by Mr. Oleg Polunin, who had been on two expeditions to Nepal, and by Mr. Aydin Bilgutay, a medical student from Istanbul who acted as our interpreter. The primary purpose of our journey was botanical exploration. Turkey has a very rich and comparatively little known flora. Not only does it possess a high percentage of endemics (species confined to Turkey), but it is also on the migration route of the Asiatic flora, part of which has penetrated into Europe by way of Anatolia.

Before I begin my account of what used to be called Turkish Kurdistan and the adjacent part of Armenia (I use the names only in a geographical sense), a few remarks on the general topography of Turkey will not be out of place. Anatolia is bounded to the north and to the south by mountain ranges; between these two barriers lies the Anatolian plateau, cut off by the mountains from much of the rain generated by the Black Sea and the Mediterranean. The plateau has a severe winter, with snow often lying for months; humidity—especially in the summer—is very low, and is the limiting factor that separates the steppe flora from that of the Mediterranean forest and maquis in the south and west parts of the peninsula. In the north, the demarcation of the steppe flora from the rain-soaked forests of the Black Sea, choked with alder and rhododendrons, is abrupt and spectacular; the Pontic Taurus forms a very effective cloud barrier.

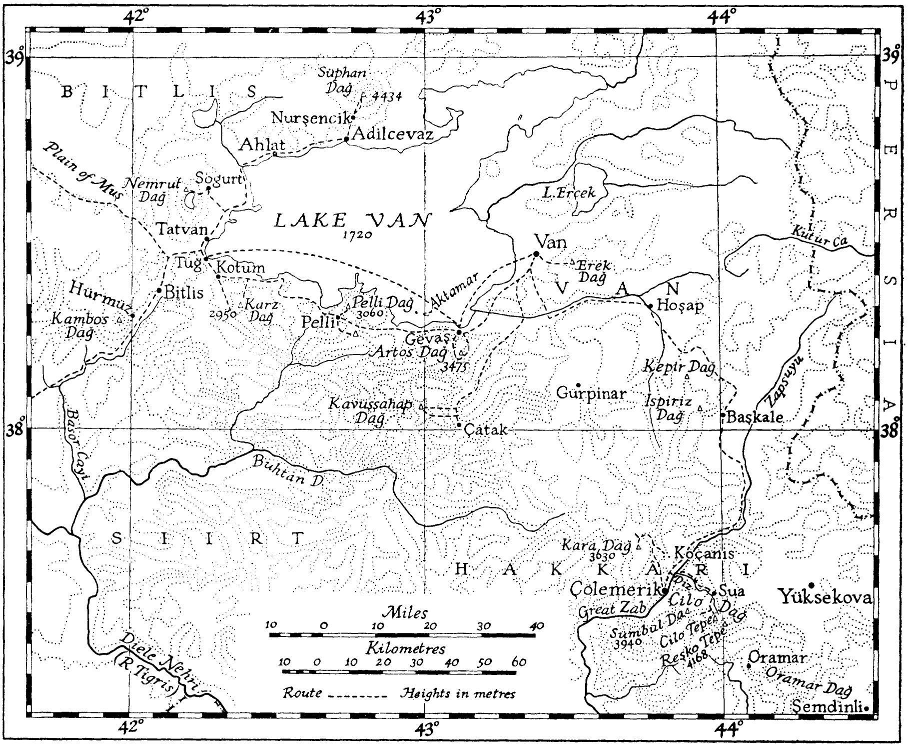
Several factors, in addition to low rainfall and humidity, and extreme winter cold, affect the vegetation of inner Anatolia. Dry winds torture the soft rocks of the plateau into weird forms; violent hailstorms help to erode it away; goats, sheep and camels severely graze the vegetation. The commonest plants are usually those that can best resist excessive grazing—either because they are unpalatable or because they are protected by an armature of spines. Many of the plants that do not possess these features find a foothold in the crevices of cliffs where they are comparatively free from grazing and obtain a stable water supply in the deep fissures of the rock. The botanist looking for rare plants must comb the steepest places.

We reached Lake Van by Land Rover at the end of June, having motored from Ankara by way of Kayseri and Malatya. In the south-west corner of the lake, at Tuğ near the old harbour of Tatvan, we found a new hotel that was clean and spacious, and service which, though inadequate, was well meant: an excellent place for a botanist, encumbered by flower presses, to use as his base.

Lake Van, lying at 1720 metres, has no outlet and contains a high percentage of alkaline salts; the soda content is about 2 per cent., being present in the form of sodium chloride, sodium carbonate and sodium sulphate. There are no fish in the lake except for the endemic *Chalcaburnus tarichi* ("Tarekh"), which is very abundant

where rivers flow into the lake. The fish are caught in spring when they migrate up the rivers to spawn; they are salted by the inhabitants to form an important winter food. On one occasion, looking down on the lake from a cliff near Adilcevaz, we saw a large water snake swimming close to the edge, far from any river mouth; it eventually swam down out of sight into deep water.

The southern shore of the lake shows at least two well-marked raised beaches, one at about 50 metres, the other at nearly 100 metres; these terraces, often clearly marked by differences in the scrub vegetation, are occasionally punctuated by caves—presumably the effect of wave erosion when the waters stood at a much



higher level. Lynch suggests that water from the lake once flowed into the adjacent Tigris (as claimed by Pliny) and that this exit was blocked by outflowing lavas from Nemrut Dağ—the lava plateau that now separates Lake Van from the lacustrine plain of Muş.[1] The result would have been a marked rise in the level of Lake Van. However, we saw extensive evidence of glaciation in the mountains to the south of the lake, and it would be interesting to know if the two major terraces could be related to climatic changes of the Pleistocene.

The water of the lake is extremely buoyant and cleansing; one emerges from it as clean and slippery as a salmon. It is fabulously blue, an enamelled desert of water surrounded by a barren landscape of snowy ranges and extinct volcanoes. Blocks of pumice float in the water, and specks of obsidian spangle the dark sand

[1] Lynch, H. J. B., 'Armenia,' vol. 2. London, 1901.

of its shore—probably brought down from the old crater of Nemrut Dağ where we found it in abundance.

We made some preliminary sorties into the countryside near Tuğ, climbing a spur of Karz Dağ from the little Armenian church at Kotum. At the end of June crimson peonies (*P. arietina*) were a wonderful sight in the limestone ravines. But at this season of the year, at nearly 2000 metres, even the steppe was still a flower garden: mulleins, pinks, yellow skullcaps and violet catmints, sage, vetch, a rosy bird's foot trefoil and numerous genera unfamiliar to us in western Europe kept us busy with flower press and camera. At the hotel we changed thousands of sheets of damp blotting paper, recruiting a gaggle of small boys to dry it for us in the sun.

Our first serious climb was Kambos Dağ near Bitlis. The old town of Bitlis is a place of great character and solidity, with mosques and minarets decidedly Persian in character. Here "the infant Tigris," as Murray's Handbook of Asia Minor (1890) picturesquely puts it, "breaks into rapids and cataracts in its passage through the town." In winter, snow lies deep for months, only the tops of the telegraph poles sticking out of the drifts; everyone stays indoors and wolves prowl down the main street. Still centre of a *vilâyet* (administrative province), it is a town in eclipse; Tuğ, busy, new, still little more than a shanty town on the shore of the lake, seems likely to replace Bitlis as the centre of life on the western side of Lake Van. A railway from Malatya has nearly reached it.

From Bitlis we drove our Land Rover to the foot of Kambos Dağ, 20 kilometres to the south-west down the gorge of the Tigris. Here it may well have been that the relics of the Ten Thousand marched through, after they had been harried by the Carduchi—progenitors of the Kurds. We walked to the hamlet of Hürmüz, bowered in walnut groves. How similar these mountain villages are, from the Atlas Mountains to Afghanistan: the little flat-topped cottages built of rough-hewn stone, the tiny unglazed windows, the thorn hedges, the walnut tree (or mulberry) by the communal spring. Two elderly Kurds, in home-spun pantaloons, brought us bowls of *ayran*—a most refreshing drink made by mixing yogurt with iced water. Thus fortified, we set off on a stiff, hot climb up the crumbling limestone slopes, aromatic with thyme, into a wilderness of screes and pinnacles. It was our first hard climb of the season and I remember little except for the glare, our thirst, and a snake that shot out while I was pulling up a plant. When one is feeling extremely tired, collecting can become almost an automatic reflex: one returns to base with flower presses bulging with hundreds of specimens (several of them new to science) but with only the haziest recollection of having gathered them.

At the beginning of July we paid a visit to Nemrut (Nimrud) Dağ, the squat extinct volcano that rises to the north-west of Tuğ. We drove to the tiny village of Sogurt, built of black lava; here the women wore scarlet dresses as though to defy their sombre surroundings. It reminded me of similar places in the Jebel Druze. Rumours that we could drive our Land Rover right into the crater—and out again—proved to be well founded. The outer slopes were gentle, and at about 2600 metres we drove the car over the rim and left it by a large snow patch. Nemrut Dağ is described by Lynch (who first mapped it) as having one of the largest perfect craters in the world, being nearly 8 kilometres across. That may be so, but it must be admitted that the effect, when you are *in* one of the largest craters in the world, is not as impressive as you might expect. The view is decidedly circumscribed. The Quaternary crater of Nemrut Dağ contains one large lake, nearly filling half the crater, and four small ones by which shepherds were grazing their flocks; one grand old man in a turban was busy shearing. There were holes in the ground

Peonies [Paeonia arietina] *on Karz Dağ*

Old Van seen from the Castle

South coast of Lake Van, between Tuğ and Pelli. Scrub oak on hills

through which hot sulphurous gases perpetually belched. The flora was limited, but interesting. Lava plugs were colonized by aspen and birch—the only time I have seen the latter (a northern tree) in Turkey. On the rim of the crater we gathered a new, yellow-flowered species of flax which we were to find on all the mountains we climbed in this region. It is related to a species confined to the top of Mount Hermon 700 kilometres away.

From Tuğ we decided to drive to Van by a little-used track along the southern side of the lake. Most of the traffic from Tuğ to Van goes by steamer (of which there are four on the lake) or by the long road round the less mountainous northern shore. But we had set our heart on the southern route and, after listening politely to several cautionary tales, set off for the village of Pelli which we intended to use as a base for climbing a pair of neighbouring peaks. The solid wheels of oxen carts had played havoc with the track; irrigation channels (often invisible till we were in them) dissected the road; but somehow we made it. Winding and bumping through oak scrub, we arrived at Pelli as the sun sank. The local schoolmaster, forwarned by the *kaymakam* of Tuğ, befriended us and allowed us to set up our beds in the village school. Everyone crowded into the room to stare at us; *ayran* was produced, and a chicken killed for our benefit. After dark the Kurdish villagers, accompanied by the music of itinerant gypsy musicians, set about dancing. We joined in, shuffling round, bobbing up and down till our supper of chicken, rice and yogurt threatened to rebel. Oleg attempted a highland fling (much appreciated) and fell over backwards (which went down even better). We tottered off to bed, worn out, but feeling that Anglo-Turkish relationships had been put on a more human, if unconventional, footing.

The next two days were spent in climbing Pelli (Pili) Dağ that juts out into Lake Van, and an unnamed peak 10 kilometres to the south-east of it. The views were magnificent. To the east and south-east the great snowcapped ranges of Kurdistan, which we were to climb during the next few weeks, lay before us in all their glittering splendour. Below us the lake, without a sign of life upon it, basked in the hot sun.

The flora of the two peaks was rich and in full bloom; *Campanula bornmuelleri* hung out its violet bells in the highest crevices; squat chequered fritillaries bloomed by patches of snow. Although the peaks were only 10 kilometres apart, the difference between their floras was remarkable—due, perhaps, to the different aspect of the slopes we climbed. We drove on eastwards, and saw below us, unapproachable, the island of Aktamar with its Armenian church of the seventh century so miraculously carved. Skirting the north slopes of Artos Dağ, we drove across the plain to Van on the east side of the lake.

Van: what a fascination that name has held for me! And I have not been disappointed. The modern town, it is true, is an architectural misfortune, without character, without charm—but a good base for an expedition; it has a market, well-stocked shops, a dowdy hotel apparently painted with prune juice, some good restaurants offering wine and beer, and a Turkish bath. What more does a traveller need? A pressure cooker? You can buy one in Van.

The magnificence of Van lies in its situation. To appreciate this it is necessary to stay at the tiny hotel on the jetty, 7 kilometres from the town, which puts one to great inconvenience but is worth the trouble. The lines of the shore are softened by bird-haunted marshes; here you can walk in the evening and watch the ripening sun fire the surrounding peaks. To the south of the lake lies the fierce, snowy wilderness of remotest Kurdistan. To the east rises the volcanic double dome of

Erek Dağ—old Varak, which once cradled Armenian monasteries. Limestone escarpments ride the plain, more beautiful even than the hills of Attica in their perfect spacing and proportions. Across the lake to the west lies Nemrut Dağ, like the wide lap of a Buddha, and the black, vast cone of Süphan Dağ; there, according to local tradition, the Ark touched before it came to rest on Ararat.

The castle of Van encrusts a narrow limestone ridge that sails the plain like a battleship. On the south side the cliff drops sheer and bears an inscription commemorating the deeds of Xerxes, son of Darius—"like a sheet of the Times Newspaper" as an earlier traveller put it. Looking down from the castle one sees, as though from an aircraft, the ruins of old Van, unhappy memorial of those reciprocal massacres that are now part of Ottoman history. Little remains beyond the crumbling labyrinth of walls, but a few Islamic domes and minarets—all that stand—are haunted by jackdaws and owls. It is a sad, depressing place, and the new town of Van has wisely turned its back upon it. A university is planned, roads and modern agriculture push forward into the eastern provinces: progress is on the way.

We visited the governor of Van, and called on the security police. We had waited nine months for our permits, but when once permission had been granted by the Government in Ankara we found all the local authorities extremely helpful. Turkey east of the Euphrates is still a military area, and permission to travel within it—particularly if one wants to camp in the mountains—remains very difficult to obtain. On July 13 we motored south to Gevaş at the foot of Artos Dağ (3475 metres), a rather isolated mountain that stands at the south-east corner of the lake. We spent the night in the mayor's office and hired horses and guides for the three days' climb. Approaching the mountain from the west side, we lunched at a *yaylâ* (summer pasture) where Kurdish women were shaking butter in a great earthenware churn suspended by ropes. The narrow track became very steep and petered out; one of the younger horses panicked and rolled down the slope, scattering flower presses far and wide. But everything was at last put in order, and as night fell we pitched camp on the south shoulder of the peak at 3000 metres by a large snow patch. A wolf came and howled at us in the night, causing temporary pandemonium in the camp.

We set off at dawn for the summit—an easy walk over limestone slopes covered with great spiny hummocks of *Astragalus*, *Onobrychis cornuta* and *Acantholimon*; these afford protection to smaller herbs that grow through them. By patches of snow the damp soil was gay with the flowers of alpine buttercups, *Gagea*, *Myosotis* and a new prostrate blue flax related to a Greek species. Artos Dağ, like Pelli Dağ and Karz Dağ, is undoubtedly largely composed of crystalline limestone, although all this region is marked on the Turkish geological map (1/800,000) as "Palaeozoic and crystalline schist." Next day we returned to Gevaş by another route—a rough descent round the east side of the peak and down a precipitous gulley. On a windy ridge at 3000 metres a most beautiful rose-pink *Hedysarum*, with silver leaves, was in full bloom—perhaps the most beautiful alpine of which we were able to get seed. On Artos Dağ and elsewhere we saw obvious signs of Pleistocene glaciation—moraines, tarns, erratics, the valleys of extinct hanging glaciers. In Kurdistan, on nearly every *massif* over 3000 metres, we saw these traces of local glaciation. The glaciers appear not to have descended much below 2600 metres—we never saw moraines near the lake. I have seen similar evidence of glaciation in the Pontic Taurus above Rize, on Bithynian Olympus (Ulu Dağ) and in the Cilician Taurus as far west as Dedegöl Dağ west of Lake Beyşehir.

Back at Van we made a day's excursion to Erek Dağ, very desiccated at the end of July, and then drove south again to the village of Çatak south of Artos Dağ. Çatak lies on a tributary of the Tigris that is full of trout. My interpreter borrowed a blunt trident and, standing in the icy water, speared a dozen by torchlight. We were assured by the peasants that all the streams on the south side of the watershed (*i.e.* flowing into the Tigris) are full of trout, but that none is to be found in the rivers flowing into Lake Van. Çatak lies in a deep valley wooded with oaks (here chiefly *Quercus libani*) and scattered trees of *Acer*, *Sorbus*, *Rhamnus*, and *Pistacia*, In Kurdistan trees are largely confined to the slopes of sheltered valleys; only on the south-west side of the lake, between Pelli Dağ and Tatvan, is there extensive oak scrub, dominated by *Q. infectoria*, on the open hillsides—probably correlated with a higher rainfall there. Even in the valleys trees peter out by 2200 metres as we enter a wide zone of herbaceous vegetation (descending to lake level where trees are absent) dominated by several large, yellow-flowered umbellifers (*Ferula*, *Prangos*, etc.); these are pollinated by vivid beetles and look extraordinarily alike until their fruits indicate to which species they belong. It was through this zonation that we passed as we climbed Kavuşşahap Dağ (over 3500 metres) above Çatak. We camped at 2700 metres, at the top of the umbellifer zone where it gives place to the spiny hummocks of *Astragalus* that I have referred to in my account of Artos Dağ. The shepherds that summer had lost numerous sheep to wolves, and were thinking of pasturing their flocks elsewhere. Between 3000 metres and 3300 metres the *Astragalus* communities give way to a more alpine vegetation on limestone screes. Rare crucifers insinuated their diffuse rootstocks between the loose stones; a most lovely dwarf pea (*Pisum formosum*), with rose-pink flowers hovering like butterflies above the fat glaucous leaves, flowered on the most unstable slopes. By rivulets coming from the melting snow we found a more northern element in the flora: the blue enamel of *Gentiana verna* of Teesdale and the European Alps, growing with the pink *Primula auriculata* and the yellow-flowered *Primula elatior* subsp. *pallasii* (the eastern race of the oxlip).

From Van we were to set off on the journey which I had dreamt of for years: to the province of Hakkâri in the remote south-east corner of Turkish Kurdistan. Our permits being in order, we drove off in much excitement towards this Shangrila where we had every hope of finding a rich, almost unexplored flora, in magnificent surroundings. As we drove south-eastwards from Van the landscape became more desert-like and took on the unearthly reddish tones of a Salvador Dali landscape. We passed the castle of Hoşap, once a stronghold of rebel Kurds, standing immensely impressive and almost Scottish baronial on an isolated rock. A long line of camels crossed the beautiful sixteenth century bridge, banded in black and white stone like a Florentine building. The road began to rise, zigzagging up the metamorphic flank of Kepir Dağ, then down towards the village of Başkale that looks across the upper waters of the Greater Zab to the frontiers of Persia. Başkale is an armed camp, a little, dirty mountain village whose *raison d'être* is to provide a locus for a military base. We stayed there long enough to climb Ispiriz Dağ (3587 metres) that rises steeply behind the village. In the umbellifer zone of the lower slopes grew a plant, familiar enough in the garden, that I had never seen wild before: the oriental poppy (*Papaver orientalis*). How fabulous, indeed how out of place, those great, scarlet, black-centred flowers looked on the bare mountain side! On Ispiriz Dağ a wide band of serpentine rock intersects the marble that forms the summit and lower slopes of the mountain. Such petrographic contrasts have their effect on the flora. The marble summit screes, which from a distance looked empty of

vegetation, proved to be scattered with rare alpines, many of which we did not see elsewhere. The affinities of the flora were decidedly Persian.

From Başkale we drove on southwards, entering the upper part of the Zab gorge. A lorry driver coming up from Çölemerik (our destination) warned us of smugglers and bears, but we spent a quiet enough night beside the rushing torrent. The road to Çölemerik has a reputation for extremely dangerous bends and a boulder-strewn surface; and indeed we did see the skeleton of more than one lorry upside down in the river that swirled hundreds of feet below us. But the surface of the road is now greatly improved, and lorries rumble along it nearly every day during the summer, bringing supplies to Çölemerik; the village is cut off by snow for five months of the year. As one descends the gorge of the Zab—the largest tributary of the Tigris—the scenery becomes increasingly savage. The river seems to follow a fault in the rock, for the cliffs are often limestone on the east side of the gorge, and slate or schist on the west. The road passes through several tunnels, and at last emerges on to a sloping terraced shelf about 300 metres above the river. This is Çölemerik, the administrative centre of Hakkâri, a village widely scattered through fields and gardens, having no natural focus behond the administrative one where the new Government buildings, built to standard pattern with a roof of corrugated metal, dwarf the rest of Çölemerik. Except for the ruins of a pleasant khan (relic of the days when the Kurds migrated to and from the plains of 'Iraq), the place has no attractive architecture. But, built as the village is on a lip of the Zab gorge, it does have a magnificent situation. The great precipice of Sümbül Dağ frowns down on Çölemerik; yet it is inaccessable across the gorge.

The very mention of Hakkâri is enough to draw groans of commiseration from any western Turk. "The road! The people! The dirt! There is nothing to eat—take everything with you!" If such an unhappy reputation was ever justified it is not so now. The road is better than many I have been on in Turkey. Çölemerik, it is true, has no hotel and nothing that can by courtesy be called a restaurant. But everyone helps, and our stay in the province of Hakkâri was, I think, one of the most pleasant of my Turkish experiences. We had an introduction to the Director of Education and were allowed to set ourselves up in the secondary school. This suited us excellently, since it gave us plenty of room for our luggage and a certain amount of that privacy which a scientist yearns for when he is travelling in the Nearer East. The school's ping-pong table proved ideal for changing the papers in the flower presses.

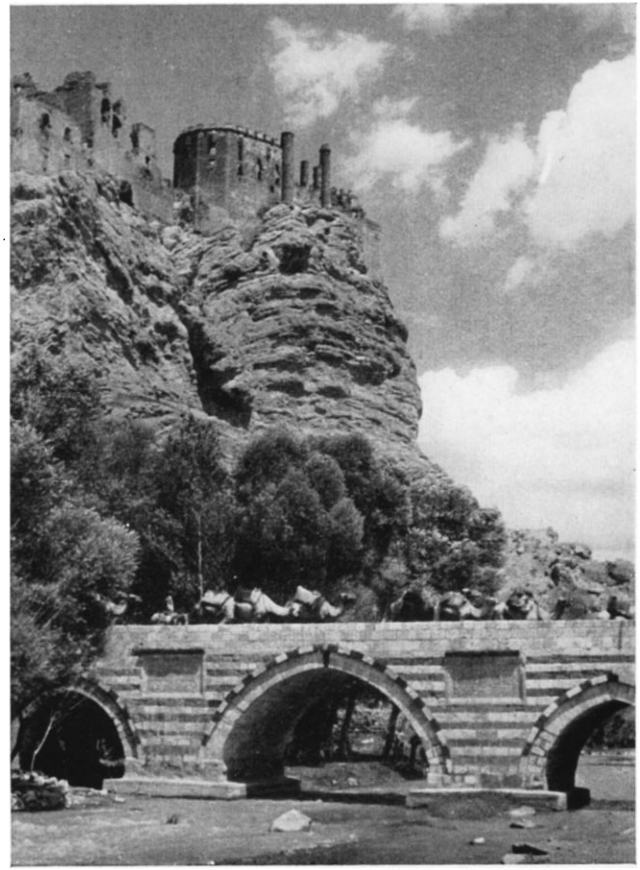
In Hakkâri we had two main objectives: Cilo Dağ and Kara Dağ, on opposite sides of the Zab gorge. We decided to tackle the more difficult Cilo *massif* first, going by the shorter, rougher route. We had been recommended to approach the mountain from Yüksekova (Gevar) on the east, but that would have taken more time than we had at our disposal. Instead, we followed the route which Earl Percy had taken in 1889.[1] Reliable Kurdish guides were chosen and sturdy horses found to carry our equipment for a week. On August 6 we forded the Zab near a police post, at its confluence with the Diz tributary. This was no easy matter, as a thunderstorm had left the river in spate. It was here nearly a hundred yards wide and flowing swiftly. The luggage was piled as high as possible on the horses' saddles and the animals driven across the river by naked Kurds who tested the river-bed with staves. We clung on as best we could and reached the other side with nothing worse than a few wet flower presses. This route can only be practicable in late summer. Earlier in the year melting snow must make it impassable; as it was, we

[1] Percy, Earl (Lord Wankworth), 'Highlands of Asiatic Turkey.' London, 1901.

Small crater lake on Nemrut Dağ

Süphan Dağ: a crater lake a 4000 m.

Artos Dağ: zone of spiny Astragalus



Castle and bridge at Hoşap

had to cross the Diz torrent several times. I should like to say a word about our Kurdish guides. We found them most reliable and glad of any opportunity to test their courage. They do much to make travel in Kurdistan much easier than it would otherwise be. Travelling in parts of the Cilician Taurus and Anti-Taurus is much more difficult because of the trouble one has in those regions in finding reliable guides and sufficient pack animals.

We followed the Diz valley right into the heart of the Cilo *massif*. Abandoned Nestorian churches stood perched on the valley sides. Here, as elsewhere in the provinces of Van and Hakkâri, we saw traces of old terraces, vines and figs run wild. Until the present century and the final exodus of the Nestorians, Hakkâri must have been relatively prosperous. But agriculture has been almost abandoned, the Kurd being more interested in his flocks than in the refinement of cultivation. This lack of interest in the land is one of the most difficult problems that modern Turkish governments have had to face in eastern Anatolia. It was in the gorge of the Diz valley that we made one of our most exciting botanical discoveries: a new species of *Primula*. It grew in crevices of apparently dolomitic limestone, and was in seed at the time of our visit. It has grown well and already flowered at the Royal Botanic Garden, Edinburgh: a very dwarf species with deep yellow flowers. Crab apples grew in the gorge (descended, perhaps, from Nestorian orchards), and we saw where their branches had been torn down by the bears that were very numerous here. We had lunch beneath a rock where, the Kurds assured us, a shepherd had been mauled to death a month before. When a bear had carried off one of the lambs, the shepherd had stoned the beast—with the not unexpected result. There is a widespread belief in Hakkâri that white bears exist in the Cilo Dağ—white all the year round. However, it must be admitted that the Kurds are singularly prone to shaggy bear stories, especially ones about bears carrying off young brides. The bear is no doubt a convenient scapegoat for an occasional abduction.

We left the Diz valley near the hamlet of Sua (Suga?), and climbed steeply to Cilo *yaylâ* below the magnificent pyramid of Cilo Tepe (about 4100 metres). Here we pitched camp for three days at 3000 metres, thanks to our guides on excellent terms with the Kurds who were encamped there for the summer. The scenery here is the most magnificent in Turkey, resembling nothing so much as the Dolomites. The great limestone cliffs (marked on the map as of Eocene age) are banded by dark volcanic intrusions. Even in mid-August snowfields are extensive. A small living glacier was recently described by a Turkish geographer as flowing from the north side of Reşko Tepe (4168 metres, the highest peak in the massif), but unfortunately we did not have time to reach it.[1] Barren though this splendid *massif* looks, it has a rich flora that is very different from the rest of Turkish Kurdistan. We collected 400 species in less than a week, and there is no doubt that a considerable number of these are new to science.

From the pass over Cilo Tepe we looked across to the mountains of Oramar and towards Şemdinli that at once became, now that we had at last reached Hakkâri, the botanist's ultimate goal; but that will have to wait for another year. We descended once more into the Diz valley where my guide sprained his ankle. "I cannot move," he groaned. "Night is coming on. The bears will get us." "Oh, no they won't!" I said, and coaxed, pulled, bullied and bribed the poor man till I got him down the ravine to rejoin the rest of the party who had wisely followed the path. By the time we reached the Zab the flood water had somewhat

[1] Izbirak, Reşat. 'Cilo Daği ve Hakkâri ile Vangölü çevresinde coğrafya araştirmalari. Ankara, 1951.

subsided and we were able to get back to Çölemerik with a wonderful collection of plants.

Before climbing Kara Dağ north-west of Çölemerik, Oleg Polunin paid a visit to the Nestorian church at ruined Koçanis. It stands on a tongue of land falling precipitously to ravines on either side, and is far superior to the little churches we had seen scattered in the Cilo Dağ. Koçanis was once the headquarters of the Nestorian patriarchs. In the sixth century the power of the Nestorian Church extended from Jerusalem to China. In the fourteenth it was the largest communion in Christendom, outnumbering both the Greek and the Roman Churches. Then it collapsed. Persecuted by Tamurlane, its patriarch and surviving followers were pushed back into this wild corner of Kurdistan. In 1890 the famous Patriarch Mar Shimum was visited by the indomitable Isabella Bird (Mrs. Bishop—the first woman Fellow of the R.G.S.). She has given the most fascinating account of Koçanis in its decline, its inhabitants raided and persecuted by the turbulent Kurds.[1] Now no Nestorians (apart from a few converted to Islam) remain in Turkey, though the sect survives over the frontier in 'Iraq and has outposts elsewhere. Many of the beautiful striped clothes worn by the Kurds are woven by Nestorians in 'Iraq. Even the sign of the Cross persists, woven into woolly Kurdish socks, its significance forgotten or ignored.

From Çölemerik a rough road to Van (via Gürpinar) passes over the east flank of Kara Dağ; until recently this road was open for about a fortnight each year, in late August or September, when the snow melts away on the 3000-metre passes. But at the time of our visit snow still blocked the road, and the authorities of Hakkâri and Van had not collaborated to clear it; with the road through the Zab gorge so much improved, there is little incentive to maintain the higher, more direct route to Van. We drove as far as we could, and camped at the *yaylâ* of Sheikh Selim Bey. The *Ağa* is the spiritual leader of the Kurds in this district of Turkey, and a most remarkable, wise and influential old gentleman. He was very animated, with a white, well-combed beard and bird-like eyes that were never still. Guests were always coming and going, and we spent a most interesting day, reclining on carpets and cushions, and eating an endless and rather mysterious meal, like an oriental Burns supper, washed down with innumerable glasses of sweet tea. The glasses were perpetually refilled until we laid them on their sides. Kara Dağ has a geology that differs considerably from that of the mainly calcareous Cilo *massif*. Its lower slopes (bristling with species of *Echinops*, *Cirsium* and *Eryngium*) consist of a greenish metamorphic rock (chloritic schist?), but the summit is undoubtedly granite—over 200 kilometres from the nearest outcrop (Toraman Dağ, north-west of Lake Van) marked on the Turkish geological map (1/800,000). There can be no doubt that this region of Turkey would be a wonderful place for geological research. Evidence of Pleistocene glaciation, well-marked on Cilo Dağ, was even more noticeable on Kara Dağ. Although late in the season (August 16) there were streams and flushes that supported a decidedly northern element in the alpine flora —gentians, primulas, moonwort, even a sedge that in Britain is confined to Ben Lawers (*Carex microglochin*). The botanical interest of Kurdistan owes much to this meeting of northern and southern floras. The phenomenon is related to the climatic changes of the Pleistocene and the varied ecological niches which the area provides for survival.

We returned to Van by way of the Zab gorge. By the lake the corn had been cut, and threshing and winnowing were in full swing. Bullocks, pulling sledges bearing

[1] Bird, I., 'Journeys in Persia and Kurdistan,' vol. 2. London, 1891.

Crossing the Zab above Çölemerik

Zab gorge at Hakkâri

Sheikh Selim Bey's encampment on Kara Dağ, Hakkâri

Sheikh Selim Bey, in white turban, Kara Dağ, Hakkâri

revolving blades, plodded round and round, threshing out the grain. Clouds of golden chaff rose in the air, tossed up by the wide winnowing forks. The whole landscape was a glorious symphony of muted yellows and old ivory, hill and plain bleached by months of sun; the snow had left all but the highest summits of Kurdistan. Only one major peak remained to be climbed: Süphan Dağ. With some difficulty we got our Land Rover on board the steamer, crammed with soldiers and gaily dressed Kurdish peasants, and sailed uneventfully to Tuğ.

We gathered seeds in the neighbourhood, climbed Karz Dağ for the second time, and then drove off round the west shore of the lake. We passed the thirteenth century Seljuk mausolea of Ahlat, built out of a rather unpleasant reddish lava, their conical roofs clearly "inspired" by Armenian churches. Most of these mausolea have none of the grace of the best Seljuk buildings in Konya, Karaman or Niğde. The Seljuk tombs of Ahlat are well known, but one hears little about the great moslem cemetery of the same period where thousands of gracefully carved headstones, leaning this way and that, cover the plateau for a vast area; they were, we thought, far more beautiful than those rather oppressive tombs. We drove on, ploughing over tracks several inches deep in volcanic dust, and reached the village of Adilcevaz near the foot of Süphan Dağ. We found an inn, and visited the most helpful *kaymakam* who arranged for horses to meet us next morning at the village of Nurşencik. The sun was rising when we drove into the little village, a cluster of low, mud-brick houses interspersed with cones of dried dung blocks. These dung cones are a characteristic feature of the plateau landscape, and, in the absence of wood, provide the villagers with fuel. As very little manure gets on to the land, crops are poor. The Government is doing its best to improve matters by sending artificial fertilizers to the eastern provinces.

Although the second highest peak in Turkey, Süphan Dağ is nevertheless one of those mountains that are better seen from a distance. All day we zigzagged our way up black dusty slopes covered with a mass of fruiting umbellifers, thorny *Astragali* and savage thistles—not a tree or shrub to be seen. Water was scarce, as it always is on these volcanic mountains of inner Anatolia. Towards evening we reached the broken rim of the crater and pitched our tents at nearly 4000 metres by a little lake. Blocks of ice floated in the water, and a glittering ice face clung to the shaded wall of the crater. At night the lake froze over. Despite its greater height, the mountain obviously gets much less snow than the main block of Kurdish peaks to the south-east. On August 26, climbing laboriously up the great lava blocks as though we climbed an endless pyramid of Cheops, we reached the top. The summit (4434 metres) consists of an eruptive mass of lava that has risen on the earlier rim of the crater and appears to have blown part of the latter away. A score of alpine plants had secured a foothold at the top, and we came upon a dead hedgehog—dropped, an ingenious Turk suggested, by one of the Lammergeyers that hopefully circled the peak. The view was worth the climb. To the south all the ranges of Kurdistan, as far as the Cilo Dağ, could be seen beyond the lake. To the north-west lay the pallid plateau, shimmering in the heat, and beyond, without a cloud upon it, the highest mountain in Turkey 150 kilometres away: forbidden Ararat, its great 5156-metre cone white with perpetual snow. We returned to the lake and got ready to make for home. Nearly three thousand gatherings of pressed plants (in quintuplicate) were packed away in crates, a most satisfactory haul from a part of Turkey whose plant life was almost unrepresented in British herbaria. Then we drove to the Black Sea, its forest dark with rain, and on to the fleshpots of Istanbul. The quail had arrived before us.

Comments on Early Armenian Knowledge of Botany As Revealed in the Geography *of Ananias of Shirak*

The *Geography* of the seventh-century Armenian author, Ananias of Shirak, is examined, first, for its position within early Armenian literature and, then, with special reference to its botanical observations.

With the publication of Robert Hewsen's annotated translation (1992) of the *Geography* of Ananias of Shirak (Anania Shirakatsi), scholars now have much easier access to the data contained in this text.[1] Numerous questions have been answered; of especial import is the continuing problem of the identity of the author of the *Geography*, for certain manuscript versions clearly say that the *Geography* was the product of Moses Khorenatsi, the "father" of Armenian history. Hewsen shows that it is significant that only one early manuscript copied before 1700 listed Khorenatsi as the author; he demonstrates that numerous phrases in the *Geography* are duplicated in other works of Ananias. Further, most estimates of the century in which the text was written point to a time coincidental with the period of Ananias' life. The reason for the suppression of Ananias' name as author can be attributed to the bad clerical odor into which this secular author had fallen. The advantages of using, as an author, such a famous name as Khorenatsi are obvious. The strongest argument against Ananias' authorship is the persistent theme that this *Geography* was written in the early seventh century, before the catastrophic arrival of the Arabs (and thus before Ananias reached maturity), since there is little reference to the Arab's presence. Hewsen replies that the impact of the Arab invasion may not have been significant in all parts of Armenia. Or perhaps Ananias simply did not care, for patriotic reasons, to acknowledge the obtrusive presence of the Arabs. This is not a wholly satisfying response, though we remember that to complex questions there are often answers that are not entirely orderly.

This Armenian *Geography* surely reflects the Greek and Roman works preceding it, of which the most complete are those of Strabo, Pliny, and Ptolemy. However, Ananias' text cannot be shown to be more indebted to one than the other of those earlier works, and Ananias makes numerous errors of his own, revealing that he had, if not a consistently accurate mind, at least an independent one.[2] The author does make clear that he was influenced by the now lost Greek *Geography* of the fourth-century mathematician Pappus. This would seem to be true (and not an addition by a later copyist) since few modern scholars, outside of Armenia, believe such a text could have been done independently by someone so presumably provincial as a seventh-century Armenian. Yet it is the consideration of most specialists, including Hewsen, that much of the material in Ananias' *Geography* results from his own scholarship, and his own independent investigation. Certainly his work on the Caucasus has details nowhere else available.

There are two textual traditions: the long (L) and the short (S). Among others, the Yerevan scholar A. G. Abrahamian[3] has argued that S is the original, and L simply an expansion of it done with commercial intent at a later date. This thesis is acceptable if we consider only the Armenian section of Ananias' *Geography*, which could have been expanded in L by an Armenian editor of a later date. However, it does not explain why there is so much additional material in L, such as that about Ptolemaic Egypt; an author capable of producing that data would have been independently able to write his own text. Consensus, accepted by Hewsen, points to

[1] Caravan books published, in 1994, with an introduction by Hewsen, the Armenian texts of both long and short versions of the *Geography*, and a reproduction of the sole manuscript of the long version.

[2] Ananias was one of the greatest Armenian scholars of his day; he received his academic training in Trebizond. Half of his surviving writings deal with mathematics, cosmology or geography, but he also wrote on precious stones, and various discourses on the festivals of the Christian Church. He probably never took holy orders.

[3] Cited in Hewsen 1992: 16.

L as the original text, while the abridgement, S, is secondary to it.

This paper will concern itself with certain botanical terms which appear in the text. I will also comment on several of these words the meaning for which is unknown to Hewsen and the earlier modern commentators on this *Geography*. There is frequent mention of terms for minerals, plants, avifauna, mammals, and even lizards and insects. The animals are mentioned because they are often exotic. Ananias cites the bonasus, Gk. βόνασος, a hornless bison, mentioned most vividly in Pliny; when angered the animal throws its dung at opponents (pp. 47, 47A);[4] in addition he reports on the customary exotic but distant animals like the dog-lion *ariwcašun*[5] and horses-tigers *vagerajik*.[6]

Not only fauna is exotic; minerals can be quite remarkable too. On the isle of Corsica, gold and silver are found which grow in the earth like the asparagus (p. 47A).[7] Another mineral, cinnabar, is mentioned (pp. 50, 50A),[8] used as a medicament. The mineral κίνναβαρι[9] which Ananias mentions (pp. 70, 70A)[10] is a particular red dye, found in one of the districts of Armenia near Mt. Ararat. Here its source is not a mineral, but a worm, which when crushed, gives out a deep red pigment. There are parallels to this fantastic worm; one is noted by Dioscorides,[11] who says that some assumed that cinnabar, because of its deep red color, was ultimately the blood of a dragon. Pliny (*NH* XXXIII.116) reinforces this fantasy by recounting a red gore that is derived from a snake when crushed by an elephant (Greppin 1992: 258, n. 28); the fabulous worm of Ananias is consistent with these other settings, and perhaps derivative. Arsenic (p. 63A)[12] is also found there (along with the chestnut), mined in Armenia and used in medicine.[13] Dioscorides notes, though, that it makes one lose one's hair (V.104: ψιλοῖ δὲ καὶ τὰς τρίχας.).

The study of plants, and the nomenclature of plants, was well developed in many cultures, presumably by the late neolithic. Certainly the ancient Greeks knew well of plants; their use, other than for food, was largely medical and here we come upon the great texts of Galen in the second century A.D., whose analysis of over one thousand plants could not be the original work of one man, but was based on considerable studies before him. But even the fifth-century Hippocrates could not have written as he did without a substantial tradition centuries old. Likewise, the Armenians had a superb knowledge of plant lore, and certainly were aware, from an early date, of the Greek studies on plants. The Armenian plant studies reached their greatest peak under the Armenian physician Amirdovlat (fl. 1450), who wrote descriptions of 3754 plant names.[14] Ancient Greek medicine, though, was not without some magical elements, common even in remotely practiced folk medicine to this day. Thus plants could be part of both magical and scientific medicine.

Ananias noted fruit trees, and this would certainly seem to be part of a geographer's purview, for fruits, in earlier ages that lacked easily available sweets and food technology in general, would have provided an otherwise missing diversity of edibles. Near the Pontic Sea Ananias found figs, bitter pomegranates, the sumac,[15] quince, *palaxunk*,[16] and the almond tree (p. 65A).[17] Other common species of flora are mentioned in scattered

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[4] Page references will be to Hewsen's translated text, the L given first. Here L reads: *Լինի անդ բոնասոս գազանն՝ որպէս զեղն, զկոյն ձգէ եւ զորսորդն այրէ* (Ananias 1881: 15), and there is a ferocious man-killing white buffalo: *Լինի ի նմա սպիտակ եւ սպանող գոմէշ* (Ananias 1881: 14).

[5] Possibly the hyena (1865: 596).

[6] Literally, a 'tiger-horse,' probably the 'zebra' because of its stripes! (1865: 596).

[7] *Ուր ոսկի եւ արծաթ հատանի երկրաբոժս իբրեւ զծնէբեկ* (Ananias 1865: 595).

[8] *Լինի ի լերինս յայսոսիկ ընտիր կինաբարիս, որ է դեղ կարմիր* (Ananias 1865: 596).

[9] The word cinnabar has cognates: Elamite *sinkabruš*, Akkadian *ṣingabrûṣ*, Old Persian *si*ⁿ*kabruš* (Bailey 1990); it also is noted in the *Galen Dictionary* (Greppin 1985: 57–58), glossed there as Arm. *xṙuk*, but its medical value, according to Dioscorides, is limited, its principal use being as a red dye employed in making paint. χρῶνται δὲ αὐτῷ οἱ ζωγράφοι εἰς τὰς πολυτελεῖς τῶν τοίχων κοσμήσεις (V. 94).

[10] *Լինի որդն սիզաբերեալ ժարմատոժ՝ առ ի զարդ կարմրութեան*: (Ananias 1881: 34).

[11] (V. 94) ὅθεν ἐνόμισάν τινες αὐτὸ αἷμα εἶ δρακόντιον.

[12] *Ունի զառիկ, եւ ի պտղոց շահէնդակ*: (Ananias 1865: 608).

[13] It is only in various compounds, such as arsenic trioxide, that arsenic is so deadly.

[14] Some have suggested that Amirdovlat was influenced by Ibn al-Baytar's *Treatise on Plants*, but this does not explain how Amirdovlat acquired so many non-Arabic (and apparently Armenian) terms. Further, Ibn al-Baytar described only 2324 plant names, 1430 fewer than Amirdovlat.

[15] This tree is used in tanning, but the sumac seed, when ground, is, to this day, spread on food to enhance flavor.

[16] Possibly to be read as *ptłaxunk*, which would be 'plant-incense,' but this is otherwise unknown, and perhaps not consistent with the other tree names mentioned in this passage. But see *pałangamušk* 'clove tree,' below.

[17] *Եվ լինի ի Տայս նուռէ, ադտոր, ռերկեւիլ, պալախունկ եւ նուշ* (Ananias 1865: 610).

parts of the narrative: pistachio tree, thistleseed, ginger, three types of aloë wood, along with wheat and rye.

More common by far than medicaments and fruit trees is the mention, in the *Geography*, of aromatics, derived from exudates (camphor, balsam, et al.), trees (aloë, sandalwood, et al.) and flowers (rose, violet, et al.). Ananias largely derived these aromatics from two areas, India and Arabia, and though many of the terms he uses are well known, others are not. Some seem to be of Arabic origin, others are Persian or Indic. Though Hewsen has been able to translate well many of these terms, and give annotations, I wish in some cases to revise his translation, and make certain additions, and it is upon those two passages, about the aromatic plants of Arabia and India, that I will concentrate.

These references, those to Indian and Arabian plants, are always to aromatic plants, mostly to aromatic woods, but to sweet-smelling flowers as well. Rarely do any of these plants have a significant medical use.[18] Aromatics were of course of great interest in ancient western Asia, to which the Old Testament bears sufficient witness. However, the earliest Christians scorned incense and scented woods. It was not until the fourth century that these became part of the ritual, the smoke being symbolic of souls rising to heaven. However, in the Armenian literature of the fifth through seventh centuries there is almost no reference to aromatic woods other than in translated texts referring to the Bible; aromatic flowers also have a very low frequency of citation. I was able to locate one instance of multiple citations of aromatics in Agathangelos, but that occurs in a passage that had religious reference and a Biblical cadence.[19] Even Narekatsi has only one aromatic reference, and that too has a sacerdotal ring.[20] Mkhitar Gosh, in his *Fables* of the late twelfth century, wrote of the beauty of the lily and violet[21] and of the slender rose,[22] but aromatics did not much concern him otherwise. In the one instance when they are mentioned, they are used as a digestive: "Oh bitter vetch and sandalwood, how good you are for the belly."[23] Arm. *čandi* 'sandalwood' is also noted in Amirdovlat no. 3533.

The S version (Ananias 1865: 612) and the L version (Ananias 1991: 39) read (pp. 72, 72A):[24]

> *Եւղք անոյշք ի նմա, եւ ծաղիկք վեշտասան՝ Հալի, (խալի), ջափու (ջաբրիկ), մաղապ (մաղադ), խալսկ (խաշուկ), քթի (քեդի), աղխունա (Հունաղհուար), խալար (խատար), բուխտակ, նարդոս (նարդին), բալասան, բան, յասմիկ, րան (նռան ծաղիկ), վարդ, մանուշակ, մարզգոշ (Նարզըը գօշ).*
>
> Sweet oils (aromatics) are there (in Arabia), and flowers, sixteen in all: *hali* (*xali*), *ǰap*^{c}*u*, *jabri*[25] (*ǰabrik*,), *małap* (*maład*), *xalsk* (*xašuk*), *k*^{c}*t*^{c}*i* (*k*^{c}*edi*), *ałxuna* (*hunałhuar*), *xalar*, (*xatar*) *buxtak*, *nardos* (*nardin*), *balasan*, *ban*, *yasmik*, *naran* (*nṙan całik*), *vard*, *manušak*, *marzgoš* (*marzigoš*).

1. Arm. *hali* or *xali*. This plant is listed in Bedevian, no. 3042, as 'saltwort, *Salsola kali* L,'[26] which is inappropriate. Bedevian also lists a similar sounding floral term, Ar. قلى *qalli* as 'glasswort, *Salicornia herbacea* L., but this too is a non-aromatic succulent. Ghazarian

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[18] I have noted in place when such a plant is discussed in Amirdovlat. And though Amirdovlat seems to have mentioned the medical value of any plant known by name to the Armenians, the aromatics he mentions have a rather small medical value. Those in the *Galen Dictionary* are the rose, violet, aloë, nard, sweet marjoram, and clove tree. This small number implies that Ananias had little interest in medicine, and indeed, of the many scholarly manuscripts he authored, none touched significantly on medical or pharmaceutical matters. Armenian medicine did not develop until the coming of the Arabs, who brought with them their energetic interpretation of Greek medicine.

[19] *Սոյնպէս եւ գունակ գունակ եւ երփն երփն ծաղիկանցն. որպէս մանրագորն եւ վարդն եւ շուշանն եւ ասպուզանն եւ յասմիկն եւ անիարն եւ ամնակն եւ ներգիսն եւ շամպղիտակն եւ մեղրուին, Հօրօթն եւ մօրօտն եւ մանիշակ.* "So there are many many kinds and colors of flowers, like the common mandrake and rose, the lily and sea bind-weed (?!), and jasmine and lotus, and Egyptian lotus and Hermodactile, and rose-campion, and jonquil and violet" (Agathangelos 1909: 330–31; from *The Teachings of St. Gregory*).

[20] *Այլ ծաղիկ դաշտի եւ շուշան Հովտաց եւ նարդոս ընտիր* "but the flower of the plain and lily of the valley, and the elegant nard" (Gregory 1948: 257).

[21] *Ձի գովիչքն (մանիշակ) նման եւս ասէին շուշանի:* (Mkhitar 1854: no. 28).

[22] *Եւ փանակութեամբ վարդ, եւ այնքան պատուին:* (Mkhitar 1854: no. 15).

[23] *Ո խոբու եւ ճանդի, որքան բարի էք որովայնի:* (Mkhitar 1854: no. 47).

[24] The L version, when different, is put second, in parenthesis.

[25] This reading is supported in the apparatus.

[26] Collenette 1985: 124, notes that it is a succulent-leaved herb, but is specifically a non-aromatic. A term *hili* appears in a medieval Georgian medical manuscript, the text of which is printed in E. Takajšvili's Описание рукописей: Общество распространения грамотности среди грузинского населения (Tbilisi 1902–4), vol. 1:192–94. There it is in the Georgian passage *alila de vaqila: hili aris*. This can be translated no better than "*alila* and *vaqila*: it is *hili*."

(1981: no. 654) mentions *halik^c* 'felwort, *Swertia*, sp. aff. *polynectaria*,' but this is noted in Colenette 1985: 252 as a leafy herb having white flowers with no scent. Bedevian gives a second meaning for the *qalli* 'glasswort, *Anabasis setifera* Moq.,'[27] but this too is a succulent, and therefore not appropriate. More likely is Adjarian's suggestion (*HAB*², 3.42) that we are dealing with Arm. *haša*, with the not uncommon misreading of լ (*l*) for շ (*š*). Arm. *haša* would be from Ar. حاشا *ḫāšà* 'headed thyme, *Thymus capitatus* Hoffmg. & Link,' which is indeed an aromatic producing a sweet oil. The word *hali* found in this text may better be emended to *haša*. The term is listed in Amirdovlat (no. 1317) as *hašay*.

2. Arm. *ǰapᶜu* or *ǰapᶜrik* are two readings; the latter is otherwise unknown (and cannot be Arabic), but the former, Arm. *ǰapᶜu* is known, being a 'hawthorn, *Crataegus oxycantha* L.,' but this is not an aromatic, producing no sweet oil. There are other readings in the apparatus to this edition, not mentioned by Hewsen, and I might cite the variant Arm. *ǰabri*, which corresponds to Ar. جربع *jarbaᶜ* (with an ᶜ*ayn*), a type of forsythia, the 'golden bells, *Forsythia suspensa* Vahl.' This is of the family *Oleaceae*, and does produce aromatic oils, and hence is a likely Arabic equivalent for Am. *ǰabri*.

3. Arm. *małap* (*maład*) might be a corruption of Arm. *małtᶜ* 'galbanum plant, *Ferula galbaniflua* Boise & Bohse,' which produces an aromatic gum resin. The term is originally Greek, μάλθα. Amirdovlat lists a *małat* (no. 2072), but identifies it as the word for three plants: 'wild mandrak,' or 'egg plant'; a 'small truffle' (none of which is appropriate); and 'galbanum', which seems entirely appropriate.

4. Arm. *xalsk* (*xašuk*) is a contortion of *xašakᶜ* 'bdellium, *Commiphora africanum* Engl.,'[28] again an example of the not uncommon confusion between լ (*l*) and շ (*š*). Bdellium is of course a strong aromatic, somewhat similar to myrrh, and would be most appropriate here. The term is present in Amirdovlat no. 1125 where it is glossed by Arm. *mułl* 'bdellium.'

5–6. Arm. *kᶜedxalhuna* is often divided into two stems. Here Hewsen, following Adjarian *HAB*² (1.100), notes we might have two terms. *kᶜedi* and *alhuna*, the latter which could be Arm. *axuna*, glossed there as a 'type of mustard, *Sinapi silvestris*,'[29] not otherwise known. I could propose a derivation from Ar. (via Persian اقحوان[30]) *aqḫawān*, which means 'chamomile' in Persian, and in Arabic has a three-fold value, all with essential oils, and belonging to the family *Compositae*. They are (a) 'fever-few chrysanthemum, *Chrysanthemum parthenium* Bernth.,' and (b) 'pot marigold, *Calendula officinalis* L.,' and (c) 'dog's fennel, *Anthemis cotula* L.' Arm. *kᶜedi* remains a mystery, and it is not at all clear that the term *kᶜedxalhuna* is to be taken apart.

7. Arm. *xalara* is translated as 'bitter vetch, *Lathyrus sativus* L.,' but this is not appropriate, being a legume used principally for fodder. Not much better would be a reading of *xatar* 'screw pine, pandang oil plant, *Pandanus odoratissimus* L.' This would be an aromatic imported from the east, the Arabic term for which is كادى *kādī*. This gloss appears unlikely, for their wealth was then, in the early seventh century, not sufficient for Arabs to import such distant items in significant volume. A reading as *xašar* 'rattan cane, *Calamus rotang* L.' is also uneventful, the rattan not being aromatic, and not indigenous to Arabia.

8. Arm. *buxtak*. This is known, according to Bedevian no. 1899, as 'candytuft, *Iberis numidica* Jord.' It is from the family *Cruciferae* and all genera have secretory cells containing myrosin, which has a pungent odor. The term appears to be a hapax in the *Geography* of Ananias.[31]

9. Arm. *nardos* 'nard, *nardus stricta* L.,' a loan, from Gk. νάρδος,[32] clearly an aromatic, as Hewsen points out; it is listed in Amirdovlat as *nardin*, no. 2351.

10. Arm. *bal(a)san* 'balm of Gilead, balsam of Mecca, *Commiphora opolbalsamum* Engl.,' as Hewsen notes. A loanword from Arabic, بلسان *balasān*. Clearly an aromatic with secretory cells. Amirdovlat no. 568.

11. Arm. *ban* 'ben-oil tree, *Moringa aptera* Gaertn.' Hewsen gives 'Belleric myrobalam, *Terminalia bellerica* Roxb.,' but this is less likely, being Ar. بليلج *balīlaj*, whereas the *Moringa aptera* is Ar. البان *al-bān*, from which the Armenian term was derived. It is known in Amirdovlat no. 2633.

12. Arm. *yasmik* 'white-flowered jasmine, *Jasminum officinale* L.,' as noted by Hewsen. From A. ياسمين *yāsmīn* id.

13. Arm. *nṙan całik*. This is read by Hewsen as *nardin* 'nard,' but this would be the second use of nard in this list (see no. 9 above). The L text reads *nṙan całik* 'flower of the pomegranate (*nuṙn*), *Punica granatum* L.,' surely an aromatic. Amirdovlat no. 1932.

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[27] There is no English term for this plant; the French is 'Anabase sétifère.'

[28] This was brought to Arabia from Ethiopia.

[29] I do not know how Adjarian obtained this gloss.

[30] Adjarian gives a form Per. اكحون *akḫūn* and Ar. اقحون *aqḫūn*, but these forms are otherwise not known to me.

[31] I do not know how this term came to be identified in Bedevian; it is not in Ghazarian 1981.

[32] This is glossed in Liddell & Scott as 'spikenard, *Nardostachys jatmansi* DC'; Ghazarian 1981 no. 879, glosses the term as a *Lamiaceae*.

14. Arm. *vard* 'the rose, *Rosa* Tourn.,' as noted in Hewsen. Amirdovlat no. 3247.

15. Arm. *manušak* 'the violet, *Viola odorata* L.,' as noted by Hewsen. Amirdovlat no. 2047.

16. Arm. *marzgoš* is glossed by Hewsen as 'chickweed,' but this cannot be right, for chickweed contains no essential oils, nor is it considered a flower. Ghazarian (1981: 66) notes *marzangoš* which he, following Bedevian (no. 2481), calls 'sweet marjoram, *Origanum marjorana* L.,' and which is surely an aromatic and a more appropriate gloss. Its medicinal values are discussed in Amirdovlat no. 2032.[33]

There is also, in Ananias' discussion of plants (pp. 75, 75A), a large number of aromatics (*bovičayk*ᶜ) that are found in India; a certain number of those terms appear to be Indic, and will here be so glossed (Ananias 1865: 615; 1881: 44):

> *ամենայն բովիճաք, Հալուէ (Հալւա), փաղանգամուշկ, քափուր (կափուր), ճանդան, նայիբուակ (բոաճառս), Հրբուակ (ախիրիբոյեկ), գազերբուակ (գոզիբոյեկ), գոյիբուակ, (ագսիբոյեակ) կասիմոն, գովողակ (դըւաղակ, քակողակ), շահաւոր (շահաւորսար), մարդարիշար:*
>
> All aromatics: *haluē*, *p*ᶜ*atangamušk*, *k*ᶜ*ap*ᶜ*ur*, *čandan*, *nayibuak* (*boačaṙs*), *hirbuak* (*axiriboyek*), *gazerbuak* (*goziboyek*), *goyibuak* (*agsiboyeak*), *kasimon*, *govołak* (*dəwałak*, *k*ᶜ*akołak*), *šahawor*, *mardarišar*.

1. Arm. *haluē*, noted by Hewsen as 'aloë wood, *Aloëxylon agallochum* Lour.'[34]

2. Arm. *p*ᶜ*atangamušk*. This is glossed variously in Bedevian as 'maidenhair, *Adiantum capillus-veneris* L.'; and 'soft-haired basil, *Ocimum pilosum* var. *O. basilicum* Willd.' The former is a leafy fern, with no odor, and the latter is a bushy leaf herb, very aromatic, but not a tree.[35] However, this term does appear in the *Galen Dictionary* (Greppin 1985: 191) where Arm. *p*ᶜ*atangamušk* is glossed by Gk. καρυόφυλλον 'dried flowerbud of the clove tree, *Eugenia karyophyllata* Thunb.,' an entirely acceptable reference to an aromatic tree.

3. Arm. *k*ᶜ*ap*ᶜ*ur*[36] 'camphor (tree), *Cinnamomum camphora* Nees & Eberm.,' as Hewsen notes.

4. Arm. *čandan*. This word is known in a remarkable number of spellings: *čandal*, *č*ᶜ*andan*, *čandi*, *santal*, and with alternate stems as well: *čermak*, and *krp*ᶜ*ul* (Bedevian no. 3064)—'white sandal wood, *Santalum album* L.,' as Hewsen notes. The word is derived, perhaps, from Indic; cf. Skt. *candana-*.

5. Arm. *nayibuak*. Hewsen, quoting Cardona (1969: 94 n. 16), breaks this word down as Pers. ناي *nayi* 'cane' plus بوياك *būyāk*[37] 'aromatic,' but what cane it refers to is unknown.

6. Arm. *hiṙuak*. Hewsen notes the Per. خيرى *xīrī*, and this would be the origin for Arm. *hir-/xir-* 'pansy, *Viola tricolor* L. var. *hortensis* DC.' Arm. *xiri* is used in Amirdovlat (nos. 2233, 2234) where it is identified as the 'gilliflower, *Matthiola livida* DC.' This pansy (family *Violaceae*) does not have secretory elements (Metcalf and Chalk 1950: 104) but the gilliflower has myrosin cells[38] (Metcalf and Chalk 1950: 80). It is unlikely that this identification is appropriate, since we seem to be dealing with trees here, not flowers.

7. Arm. *gazerbuak* 'nutmeg tree, *Myriophyllum spicatum* L.,' from Indic **gauz* (note Per. جوز *ǰauz*) 'nutmeg,' and Arm. *gazerbuak* would mean 'scented nutmeg.' The term Arm. *ǰuzēr* is listed in Amirdovlat (no. 789) but without a clear gloss. Arm. *gazerbuak* is in Bedevian (no. 2363) 'nutmeg.'

8. Arm. *goyibuak*. Unknown, but *buak* is, of course, 'aromatic.'

9. Arm. *kasimon* 'cassia, *Acacia farnesiana* Willd.' An aromatic also called 'sponge tree'; noted by Hewsen.

10. Arm. *govatak* (S) or *k*ᶜ*akołak* (L). Probably related to Indic, Skt. *kolaka-* 'Indian bdellium, *Commiphora mukul* Engl.,' an appropriate tree.

11. Arm. *šahawarsar*. This might be two Indic plant names: Skt. *sahā* 'aloe' (Varāha-mihira's *Bṛhat*), and *rāsnā* 'bdellium' (*Bhāvaprakāśa*). We should understand that neither of these glosses can be considered absolute; yet they do point to aromatic Indic woods.

12. Arm. (*mar*)*dasišak*. The final morpheme *šak* is related to Skt. *śāka* 'teak'; *dari* is most likely a corruption of Skt. *dāru*, Per. دار *dār* 'wood:' hence 'teakwood,' a resinous aromatic.

JOHN A. C. GREPPIN
CLEVELAND STATE UNIVERSITY

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[33] Among other characteristics, it expels the mense and helps nausea.

[34] There was a shift of meaning for aloë in ancient times, and it passed from being the name for a succulent with fleshy leaves, imported from Arabia and elsewhere, to an aromatic wood of Indian origin (Greppin 1988).

[35] So notes Collenette 1985: 406, and 274.

[36] This could also be *k*ᶜ*amp*ᶜ*ur*, or later *k*ᶜ*afur* (Amirdovlat no. 3533).

[37] MP *būyāk* id.

[38] The gilliflower is noted in Bos's edition (1992) of Qusta ibn Luqa's work on health needs for the hajj, where the oil of the gilliflower (ك)دهن الخيري is said to be useful in massages.

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CHAMA — Collection des historiens anciens et modern de l'Armenie, par Victor Langlois, Paris
PO — Patrologia orientalis

Ա. ԶԵՅԹՈՒՆՅԱՆ

ԲՈՒՅՍԵՐԻ ՊԱՇՏԱՄՈՒՆՔԻ ԱԶԴԵՑՈՒԹՅՈՒՆԸ ՀԱՅԿԱԿԱՆ ՄԻ ՔԱՆԻ ՏԵՂԱՆՈՒՆՆԵՐԻ ՎՐԱ

Բույսերի պաշտամունքը նախաքրիստոնեական շրջանում այս կամ այն չափով տարածված է եղել աշխարհի բոլոր ժողովուրդների ու ցեղերի մեջ։ Այն Հայաստանում ևս տարածված է եղել հեթանոսության ժամանակ։ Բազմաթիվ նյութեր կան կաղնու (Quercus), սոսու (Platanus), թեղու (Ulmus), բոշնու (Celtis), ընկուզենու (Juglans), բարդու (Populus), ուռենու (Salix) և այլ ծառատեսակների պաշտամունքի վերաբերյալ։ Այդ պաշտամունքի կենդանի վկաներն են այն ծառերի դարավոր ներկայացուցիչները Հայաստանի զանազան մասերում, որոնց «սրբազան» են կոչում։ Այդ պաշտամունքի հետքերն են կրում նաև մի շարք աշխարհագրական անուններ։ Ինչպես, օրինակ, Արածանի գետի ափին Օխչի անունով գյուղ կա, որի անվան ծագման

մասին եղող ավանդությունն ասում է, որ դա առաջացել է «ողջույն» բառից, քանի որ, ըստ ավանդության, այդ տեղի ծառերը ողջույն են տալիս[1]։ Նույնպիսի ավանդություն են պատմում Մուշի գավառում գտնվող Բարեխծառ կոչվող ուխտատեղիի ու վանքի մասին[2]։ Ծառերին՝ բարևելու, ողջույն տալու հատկություն վերագրելը հեթանոսական հավատալիքների հետ է կապված և տեղանունները կրում են դրա ազդեցությունը։ Այդ ծառապաշտության ազդեցությունն են կրում նաև Բագահառիճ, Տիրառիճ, Խոկառիճ, Գուկառիճ և այլ տեղանունները, որոնց հառիճ կամ առիճ վերջածանցի բացատրությունը չի տրված[3]։ Ըստ Հ. Աճառյանի, դա narič բասկական բառն է, որը կաղնի է նշանակում[4]։ Նույնպիսի ստուգաբանություն պետք է տալ Հառիճ վանքի անվանը, որի մասին Արել վարդապետ Մխիթարյանը գրում է. «Այլ Հառիճ անունս անմարթ եղև ստուգաբանելս»։ Հիմնվելով Հ. Աճառյանի ստուգաբանության վրա, մենք հանգում ենք այն եզրակացության, որ վանքի Հառիճ անունը մնացել է դեռևս կաղնու հեթանոսական պաշտամունքի ժամանակներից։ Վերոհիշյալ բառերում «բագ» և «տիր» բաղադրամասերը ցույց են տալիս նրանց պաշտամունքի կենտրոն լինելը։ Նույնպիսի ծագում ունեն հայկական մի շարք այլ վանքերի անուններ, ինչպես օրինակ՝ Եղրդուտի վանքը, Կնեվանքը և այլն։ Եղրդի բույսի անունով կոչված վանքը գտնվում է Մուշի արևելյան կողմում, Սիմ լեռան վրա։ Եղրդին (Salıx aegiptiaca) մշտադալար ուռենու մի տեսակն է, որի հոտավետ բողբոջային թեփուկները ժողովրդական բժշկության մեջ գործածվում են որպես հակատենդային միջոց, իսկ ինքը ծառը «Օղ մաքրող» է կոչվում։ XIII դարի հայկական մի ձեռագրում կա այդ վանքի կառուցման մասին հետևյալ ավանդությունը. Թադեոս առաքյալը իր մոտ եղած օծման յուղը պահում է Տավրոս լեռան ստորոտում, որտեղ կար մի եղրդի ծառ։ Յուղը մնում է այդտեղ երկար ժամանակ, դրա մասին իմանում է Գրիգոր Լուսավորիչը և երբ գնում է այնտեղ, տեսնում է, որ այդ վայրում լույս է իջել։ Հենց այդտեղ էլ շինում է մի եկեղեցի, որ և կոչվում է Եղրդուտի վանք[5]։ Իրականում մենաստանի մոտ մինչև այժմ էլ կա մի եղրդի ծառ, որը հատուկ խնամքով պահպանվում է[6]։

Ինչպես պատմում է Ստ. Օրբելյանը, ավանդություն կա Կնեվանքի անվան ծագման մասին։ Այդ ավանդությունը ասում է, որ երեխաները խաղալիս պոկում են կնյունը (Iuncus), խաչ են սարքում և սկսում երկրպագել, խոստանալով մատաղ անել երեք եզ։ Երբ ուզում են հեռանալ, եզները տեղից չեն կարողանում շարժվել։ Հայտնում են տերերին, նրանք գալիս են և իմանում են պատճառը. «Կոչեալ այնուհետև քահանայս օրհնեցին զխաչն և զեզինն զեզինսն և պատուեցին զտեղի կնիւնին։ Աղդ լինէր այս իշխանացն Սիւնեաց. և գային ի տեսութիւն. և հրամայեցին շինել եկեղեցի ի տեղւոջն. և սահմանեցին զնա տուն կրօնաւորաց, բայց զտեղի կնիւնին թողին ի մէջ եկեղեցւոյն փոս մի զուգնարեայ... և դեռևս կայ եկեղեցին և ի տեղի կնիւնին և խաչ ես, որք վկայեն անսուտ գոլ» (ընդգծումները մերն են — Ս. Ա.)[7]։

Բերենք մի օրինակ էլ։ Կիլիկիայի հռչակավոր Արքակաղնի վանքի անունը ըստ Ղ. Ալիշանի՝ «անշուշտ յանուն ծառոց, յորոց ի միջի ծածկէր՝ կոչեցեալ Արքակաղնի վանք»[8]։ Այդ մենաստանը այնպես էր թաղված անտառախիտ կաղնի ծառերի մեջ, որ տեղը բոլորովին անհայտ էր մնացել մինչև XVIII դարը։ Միայն 1737 թ. քրտնաջան աշխատանքից հետո հայտնաբերվեց նրա տեղը[9]։

Վերը թվարկված անունների կողքին կարելի է ավելացնել Նոնենից, Խնձորուտի, Թեղենյաց կամ Թեղուտի, Կեչառիսի և ուրիշ վանքերի անունները։ Վանքերը այդ անունները ստացել են ծառերի պաշտամունքի հեթանոսական շրջանից։

Ս. ԱՎԴԱԼԲԵԿՅԱՆ

1 Ս. Հայկունի, Բագրեւանդ. Ջրարաշխ գավառ։

2 Ա. Թարախանյան, Ուխտավորի հիշատակարանը, Շուշի, 1885։

3 Հ. Հյուբշման, Հին հայոց տեղվո անունները։

4 «Պատմութիւն մենաստանին Հառիճոյ ի Շիրակ», Տփղիս, 1856։

5 Գասպանագիրք Կ. վրդ. Լուսարարյան, Երուսաղեմ, 1912։

6 Վ. Ոսկյան, Տարոն-Տուրուբերանի վանքերը։

7 Ստեփաննոս Օրբելյան, Պատմութիւն նահանգին Սիսական, Թիֆլիս, 1910, էջ 339։

8 Ղ. Ալիշան, Սիսուան։

9 Ղ. Ինճիճյան, Նոր Հայաստան։

նից, Թրիալեթիից, Ուզերլիկ-Թեփեից[12] և այլ հուշարձաններից, որոնք թվագրվում են միջին բրոնզի վերջին դարերով։

Հաջորդ խմբի կավանոթները սև կամ դարչնագույն մակերեսով, երկթեք իրանով, կլոր կամ երկարավուն կանթով գավաթներ են (աղ. III, նկ. 12—13)։ Այսպիսի գավաթներ հայտնաբերվել են Էլարից, Գառնիից[13] և այլ վայրերից։

Ելնելով վերը ներկայացված դամբարանների և նրանցից հայտնաբերված նյութերի համեմատական ուսումնասիրությունից, կարող ենք ասել, որ Շիրակի դաշտի և մասնավորապես Քեթիի միջին բրոնզեդարյան մշակույթը իր բնորոշ կողմերով սերտորեն կապվում է համահայաստանյան՝ մ. թ. ա. II հազարամյակի առաջին կեսով թվագրվող մշակույթի հետ և կազմում է նրա անբաժանելի մասը։

Լ. ՊԵՏՐՈՍՅԱՆ

«ՊԱՏՄՈՒԹԻՒՆ ՀԱՄԱՍՓԻՒՌ ԾԱՂԿԻՆ»

Մաշտոցի անվան Մատենադարանի բնր ձեռագրերում պահպանվել է մի գրույց համասփյուռ ծաղկի մասին, որ վերնագրված է «Պատմութիւն համասփիւռ ծաղկին», կամ «Վասն ծաղկին»։ Այս գրույցում թվարկված են այդ ծաղկին վերագրված հրաշագործությունները։ Զրույցի մեջ ասված է. «Թէ ի ականջդ հասուցանես զվիրնական ձայն և դբարբառ լսես և հասկանաս զամենայն լեզուս մարդկան և իմանաս զձայն անասնոց և գազանաց և թռչնոց. ապա թէ ի աչքտ հասուցանես, զամենայն արարածք առաջի աչացդ տեսանես. իսկ թէ ի քիմքտ հասուցանես, զհոտ անուշ յերկնից առնուս, ապա թէ ի լեզուդ հասուցանես, զամենայն լեզու զըրուցես և բարբառես, զիմաստութիւն իմաստնոց և զվարդապետութիւն պատմես, ապա թէ ի մատունքդ հասուցանես զամենայն արհեստ (կամ արուեստ) առնես... Եւ բազում ինչ ասացին վասն ծաղկիս զօրաւոր հրաշս մեծամեծս»[1]։

Այս վերջին արտահայտությունը մեզ թելադրեց այլ աղբյուրներում էլ հիշատակություններ որոնել համասփյուռի հրաշագործությունների մասին։ Մյուս աղբյուրը Մխիթար Գոշի առակներն են։ 26-րդ առակում պատմվում է, թե ինչպես բույսերը թագավոր են ընտրում. «Եւ եղև ոչ սակաւ հակառակութիւն, զի ոմանք ասէին զշուշան լինել, և այլք զախրիզանն, և բազումք զհամասպրանն (նույնը՝ համասփյուռ— Ս. Ա.)[2] և ամենեցուն հաճոյ թուեցաւ լինել համասպրանն... զի ամենայն տիրիցէ աշխարհի. և մանաւանդ զի մեծամեծ ունելով զօրութիւն բժշկութեան՝ զհիւանդս բժշկիցէ և քաջատես առնիցէ, և ի վերայ ծովու գնալ տացէ, և իմաստութեամբ զօգէտս լցցէ»[3]։ Այստեղ չեն կրկնվում նախորդ գրույցում թվարկված հրաշագործությունները, այլ նորանոր հատկություններ են ավելացվում։

XVII դարի բանաստեղծ Դավիթ Սալաձորցին իր «Գովասանք ծաղկանց» տաղում պատմում է հնագույն մի ավանդություն համասփյուռ ծաղկի մասին։

Արքայիկ օձն թագաւոր, ինքն սպիտակ
որպէս զձիւն,
Համասփիւռին կու հետեվի և զօրութիւն
կառնու հոտոյն[4]:

Արքայիկ օձը՝ օձերի թագավորը, իր զորությունը վերցնում է ծաղիկների թագավորից։ Իսկ արքայիկ օձի զորությունը նրա նայվածքի մեջ է, որն այրում, սպանում է։ Մի ավանդություն կա այն մասին, որ երբ Ալեքսանդր Մակեդոնացին պաշարել էր մի ասիական քաղաք, արքայիկ օձը պարսպի վրա գտնվող անցքից իր հայացքով 300 մարդ է սպանում Ալեքսանդրի զորքից[5]։ Արքայիկ օձի ծնունդը կապվում է բաջահավ կոչվող թռչունի հետ (բաջ, ոգի բառից, իբր հոմանիշ «արտավազդահավ» բառի, որ ծագում է Արտավազդի անունից. իբր

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[12] А. А. Мартиросян, նշվ. աշխ., նկ. 32։ Հ. Հ. Մնացականյան, նշվ. աշխ., աղ. III, նկ. 3—4, 6։ Э. М. Гогадзе, նշվ. աշխ., աղ. XIX, նկ. 2; նկ. 31, 2—3-րդ շերտերի 2-րդ խումբ։

[13] Է. Վ. Խանզադյան, Գառնի IV, նկ. 80։

[1] Մաշտոցի անվ. Մատենադարան, ձեռ. №№ 6488, 5747, 5616, 7993, 7100, 549, 8737, 10020, 7085։ Տե՛ս նաև Ն. Մառ, Ժողովածոյք առակաց Վարդանայ, Բ, Ս. Պետերբուրգ, 1894, էջ 300։

[2] «Նոր բառգիրք հայկազեան լեզուի», Վենետիկ, 1837, հատ. 1, էջ 21։

[3] Մխիթար Գոշ, Առակներ, Երևան, 1951, էջ 61։

[4] Կ. Կոստանյան, Նոր ժողովածու, պրակ Բ, Թիֆլիս, 1892, էջ 75։

[5] «Բազմավեպ», Վենետիկ, 1850, էջ 140։

քաջքերից շղթայված թագավորի թռչունը)[6]։ Այս թռչունը (իբիս), որ եգիպտացիների կողմից պաշտվում էր, օձահալած է, ոմանք ղըտնում են, որ նաև օձակեր է, իբր սրա ձվում է գոյանում արքայիկ օձը։

«Պատմություն համասփյուռ ծաղկին» զրույցում վերոհիշյալ հրաշապատումների կողքին նշվում են համասփյուռի աճման վայրերը. «Երթ ի Բասեն և խնդրեա զդեղն, որ կոչի Դարոյնս ուր ջերմուկն է»։ «Եւ այլք ասացին թէ գտանի ծաղիկն ի Սուրմարի գեղըն որ կոչի Զողկերտ (կամ Ցօղկերտ—Ս. Ա.)»։ Ցողկերտը հին ուրարտական ամրոց է եղել, որտեղ գտնվել են սեպագիր արձանագրություններ[7]։

Ղ. Ալիշանը բուսաբանների հավաքած նյութերի հիման վրա համասփյուռը մեխակազգիների ընտանիքի Lychnis ցեղի մի տեսակ է համարում։ Նորագույն հետազոտությունները պարզել են, որ դա նույն ընտանիքի Melandrium ցեղին է պատկանում։ Ռուսերեն дрёма է կոչվում[8]։ Ռուսներն ունեցել են дрема կոչվող պաշտամունքային շուրջպար։ Ռուդոլֆ Բլաումանիսի «Օրորոցային» երգում дрема-ն մի ոգի է, որ շրջում է տան մոտ ու որոնում իր սպիտակ ծաղիկը։ Ծաղիկը դնում են երեխաների օրորոցներում, քուն բերելու համար.

Возле дома бродит дрема
Где мой беленький цветок?
Баю-баю, бродит дрема
Ищет в сумерках цветок...
Принеси его и тихо
В изголовье положи
Баю-баю. тихо-тихо
в колыбельку положи[9].

Այս վերջին փաստերը ցույց են տալիս, որ համասփյուռ ծաղիկը պաշտամունքի առարկա է եղել նաև այլ ժողովուրդների մոտ։ Պետք է հուսալ, որ հետագա որոնումները հնարավորություն կտան հարստացնելու, ամբողջացնելու և վերականգնելու համասփյուռի վերաբերյալ հին պատկերացումները։

Ս. ԱՎԴԱԼԲԵԳՅԱՆ

[6] Մ. Քաջունի, Բառգիրք արվեստից և գիտությանց, Վենետիկ, 1891։

[7] Մ. Սմբատյան, Տեղագիր Գեղարքունի ծովազարդ գավառի, Վաղարշապատ, 1895, էջ 769 («Մասիս լերան հյուսիսային ստորոտում եղած ընդարձակ ավերակների մեջ, սկսած Փառախոտից (Արհաջ) մինչև Յոլակերտ (Տաշբուրուն), որոնց միջոցումն է հին քաղաքատեղին Արշակավան»)։

[8] «Բույսերի անունների լատին-հայ-ռուս բառարան», Երևան, 1962։

[9] Р. Блауманис, Стихи, М., 1971, էջ 20—21։

ДВА НОВООТКРЫТЫХ ПАМЯТНИКА МНОГОАПСИДНОЙ КОМПОЗИЦИИ

Среди разнообразных композиций средневековой армянской архитектуры наиболее оригинальный ее отдел составляют многоапсидные памятники. Отличительной особенностью этих сооружений является их близкая к круглой конфигурация, которая сильно централизует подкупольное пространство, что хорошо понимали древние зодчие уже в эпоху раннего христианства.

Преобладающее большинство многоапсидных сооружений были часовнями или гробницами. Наиболее древними памятниками этой композиции являются гробница Кальвентиев (III в.), мавзолей Диоклетиана (305 г.), мавзолей Галерия (306 г.) и храм Нимфей Миневра Медика (IV в.)[1]. Этим сооружениям свойственна монолитность внешнего контура купола с нижней ротондой. В отличие от этих сооружений купол многоапсидных композиций Армении возвышается на барабане, который в диаметре значительно уступает размеру нижней ротонды и тем самым расчленяет композицию внешнего контура на два яруса. Аналогичную композицию имеет церковь св. Виталия в Равенне (547 г.)[2]. Однако членение внешнего контура посредством разномерности купола и основания здесь осуществлено не расширением подкупольного пространства, а наличием кольцевой галереи, охватывающей центр.

В мировой архитектуре последующих веков многоапсидные сооружения большого распространения не находят. В армянской же архитектуре они продолжают строиться до XIII в. и достигают

[1] «Всеобщая история архитектуры», т. II, М., 1973, стр. 530—541, 573—574, 658—661.

[2] «Всеобщая история архитектуры», т. III, Л.—М., 1966, стр. 73—74.

local and family influence on politics, and to enfranchise new citizens many of whom were resident aliens (cf. Ezek. 47: 22 f.), Cleisthenes revolutionized the tribal system in a way that evokes the wonder of modern historians: "A system more artificial than the tribes and trittyes of Cleisthenes it might well pass the wit of man to devise."[29]

Taking the map of Attica as he found it, consisting of between one and two hundred demes or small districts, Cleisthenes distinguished three regions: the region of the city, the region of the coast, and the inland. In each of these regions he divided the demes into ten groups called *trittyes*, so that there were thirty such trittyes in all. . . . Out of the thirty trittyes he then formed ten groups of three, in such a way that no group contained two trittyes from the same region. Each of these groups constituted a tribe, and the citizens of all the demes contained in its three trittyes were fellow tribesmen. . . . The ten new tribes, based on artificial geography, took the place of the four old tribes, based on birth. . . . And the deme, a local unit, replaced the social unit of the clan. This scheme of Cleisthenes . . . might seem almost too artificial to last. The secret of its permanence lay in the fact that the demes, the units on which it was built up, were natural divisions, which he did not attempt to reduce to a round number.[30]

The reform of Cleisthenes and Ezekiel's resettlement scheme have in common: tribes, geographical regions whose nature (if we have interpreted Ezekiel rightly) is crucial for the scheme, and resident aliens that must be integrated. How differently each dealt with these variables is most instructive. The Athenian had a democratic ideal before him, the Judahite, an ideal of concord and justice, ultimately based on religion. The motive for integrating the resident alien illustrates the difference. For the former, it was a matter of reshaping the balance of political power; for the latter, the fulfillment of an ideal of equal treatment under the law. Even more characteristic: for the Athenian, the locality was fundamental, the tribe an artificial, political creation. For the Judahite, the tribe was fundamental and the locality artificially molded to serve it.[31] On the score of artificiality, however, Cleisthenes' historically attested reform makes the visionary tribal apportionment of Ezekiel seem the essence of simplicity and naturalness.

* * * * *

The priestly writers, like the legislators, were fond of ideal formulations. But to understand them it is necessary to credit them with more than extravagant imagination, reckless of reality. "In framing an ideal we may assume what we wish, but should avoid impossibilities." In the two items we have studied the priestly writers have hewn to Aristotle's injunction.

[29] E. M. Walker in *CAH*, iv, 143; I am grateful to my teacher and colleague Lloyd W. Daly for bringing Cleisthenes' reform to my attention.

[30] J. B. Bury, *A History of Greece*[3] (London, 1951), pp. 211 f.

[31] On the significance and persistence of familial groupings in Israel, cf. Speiser, "'People' and 'Nation' of Israel," *JBL* 79 (1960), 157-163.

OIL PLANTS IN HITTITE ANATOLIA

HANS G. GÜTERBOCK
ORIENTAL INSTITUTE, UNIVERSITY OF CHICAGO

IN THE RITES aimed at bringing back the vanished god several kinds of fruit are used for "Analogiezauber." Beside such examples as the fig, which holds "a thousand seeds," or the raisin, which has wine in its interior,[1] the olive is mentioned as holding oil. It is, however, not the only such fruit: there is $^{\text{GIŠ}}$*ša(m)ma(m)ma*, which is also said to hold oil, and $^{\text{GIŠ}}$*liti-/leti-*, which seems to be of a similar nature. Since all three occur side by side in the same texts, neither *šamama* nor *liti-* can be the Hittite reading of the Akkadogram $^{\text{GIŠ}}$*ZÉ-ER-DU*,[2] "olive." The prob-

[1] Thus, $^{\text{GIŠ}}$GEŠTIN.È.A (=UD.DU.A), e.g. KUB XXXIII 68 ii 13 (*RHA* 77, 128); 74 i 5 (ibid. 164, line 14); XVII 12 iii 10 f.; 13 ii 5 f. (ibid. 144, partly restored). One would expect fresh grapes rather than dried ones! In KUB XVII 10 ii 19 the word is lost, restoration without È.A (*RHA* 77, 93) is possible but not certain.

[2] Akkadian *sirdu*, but in Boğazköy always written with *zé* (KUB XXXVII 2 with *si* in obv. 18 is Babylonian import according to Köcher's note in the introduction).

lem, thus, is to determine the meaning of the two Hittite words.

For ^{GIŠ}*šamama* the translation "sesame" has been proposed and entered in the dictionary.[3] The present writer has for a long time held a different opinion which he will set forth in the following pages. The scholar to whose memory this issue is dedicated was always interested in problems of material culture, especially such that were connected with the spread of a term. In addition, another contribution to this issue is dealing with the problem of the very existence of sesame in the ancient Near East, so that it may not be out of place here to bring the Hittite evidence into the debate. While the decision as to whether *šamaššammu* is sesame or not must be left to others, I shall here use the traditional translation "sesame" for the sake of convenience.

The ideogram of Akkadian *šamaššammu*, ŠE.GIŠ.Ì, occurs in Hittite texts.[4] It clearly refers to the seed: it is strewn on bread (KBo VIII 91 rev. 3 f.), or the word is used to designate a special kind of bread: NINDA.ŠE.GIŠ.Ì "sesame bread," NINDA.LÀL.ŠE.GIŠ.Ì "honey bread with sesame."[5]

Much more frequent is the term for the oil, Ì.GIŠ.[6] Again we may leave aside the question of whether this is sesame oil or some other kind as well as the problem of the Akkadian reading, *ellu* or *šamnu* (see the discussion in the dictionaries just quoted). We may safely do so since there is nothing in the Hittite texts which would link Ì.GIŠ with the word primarily to be discussed here, ^{GIŠ}*šamama*.

A typical passage from the invocation rituals is KUB XVII 13 col. ii:[7]

(1-4) Behold, [olives are lying here.] Just as [the olive] holds oil in its 'heart,' thus [hold thou, o Mother-goddess,] the king, queen, princes and the land of Hatti in friendliness in thy heart and soul!

(5-8) Behold, raisins are lying here. Just as the [raisin] holds wine in its 'heart,' thus hold thou, (etc.).

(9-12) Behold, ^{GIŠ}*šamama* are lying here. Just as the ^{GIŠ}[*š*.] holds oil in its 'heart,' thus hold thou, (etc.).

(13 f.) [Beho]ld, *le*[*tiš* is lying here. Just as the *letiš* . . . . .] evil [. . . . (continuation broken).

These stereotype passages from invocations may be tabulated as follows:

KUB XVII 13 ii

RHA 77, 143 f. (above)

[olive]	— oil
raisin	— wine
šamama	— oil
le[*tiš*]	— [. . .]

KUB XXXIII 74 + . . . , i

RHA 77, 164 f.

fig	— 1000 seeds
raisin	— wine
olive	— oil
letiš	— to *lilarešk-* heart and soul
šammamma	— [. . . .]

HT 100 + . . .

RHA 77, 163

fig	— sweet
liti	— to *lilarešk-*
raisin	— wine
olive	— oil

KUB XVII 12 iii 8 ff.

Oriens XV 350

fig	— 1000 seeds
raisin	— wine

KUB XXXIII 75 ii 16 ff.

RHA 77, 146

fig	— 1000 seeds
olive	— [oil]

[3] First used by Goetze in *ANET*, p. 127, translating KUB XVII 10 ii 15; advocated by H. Otten, *Hethitische Totenrituale* (1958) (abbr. *HTR*), p. 134; accepted by J. Friedrich, *Hethitisches Wörterbuch* (*HW*) 2. Ergänzungsheft, pp. 22 and 31.

[4] References given by E. Laroche, *RHA* XIX/68 (1961) 45.

[5] KBo VIII 89 obv. 12; Bo 2040 rev. 16 in *HTR* 134.

[6] Friedrich, *HW* 277 without reference; Deimel, ŠL 231, 157 without ref. to Boğazköy; see *CAD* s. v. *ellu* B, *AHw* s. v. *ellu*(*m*) II. A few random references to Boğazköy texts follow: KUB IX 6 i 6-11 (Otten, *LTU* p. 37); XII 15 vi 10, 18 (cf. KUB XI 31 i 21, which writes simple Ì in analogous context); XXV 42 iii 11; KBo XV 47 rev. 7 with dupl. 48 iv 6; 52 vi 33.

[7] Transliterated by E. Laroche in *RHA* XXIII/77 (1965) 143 f. For all texts transliterated there we simply refer to *RHA* 77.

KUB XXXIII 68 ii 6-16

RHA 77, 128

fig	— 1000 seeds
šamama	— (different, see below)
raisin	— wine
olive	— oil

In some texts there is more variety in the wording of these spells. In the Telipinu text, first version (KUB XVII 10 ii 15 ff., *RHA* 77, 92 f.), this particular group reads as follows (the preceding and following spells are not relevant here):

(15) *kaša* GIŠ*šamamma kitta* [. . .
(16) *šakuwan eštu*. There follow:
the fig — being sweet
the olive — holding oil
the [raisin] [8]— holding wine; then:
(22) *kaša* GIŠ*liti kitta*
nu ŠA d*Telipinu* [. . .
(23) *iškiddu.*

Here again, *šamama*, olive, and *liti* occur side by side; but whereas the passage about the olive has the well-known form, we are told that something should be *šakuwan* [like] [9] *šamama*. Unfortunately the adjective/participle *šakuwant-* is still far from clear,[10] so we cannot—at least not yet—use it to determine the character of *šamama*.

For *liti* we learn from this passage that it has something to do with anointing (*iškiddu* "let it anoint"); and since it has here (as also outside the texts so far listed) the determinative GIŠ, we may safely consider it as falling into the same class as GIŠMA "fig," GIŠGEŠTIN "grape, raisin," GIŠ*SERDU* "olive," and GIŠ*šamama*, in other words, take it as the name of a tree and its fruit.[11] It is for this reason that we listed *liti-* as an oil-bearing fruit in our introduction. Unfortunately the verb *lilarešk-* [12] is unknown. While a general or derived meaning like "to appease, propitiate" may be guesssed at, it is hard to determine the concrete meaning of the verb said of the fruit *liti-*, except that the verb *išk-* "to anoint," used in connection with the same fruit in the Telipinu spell, may perhaps indicate in what direction one might look.[13]

Turning to other ritual texts, we find *šamama* included in various lists of ingredients. These are as follows:

1. KUB XII 26 iii 11-14

BAPPIR	'beer bread'
BULÙG	malt
GA.KIN.AG	cheese
UZU.Ì	suet
GIŠ*ZÉ-ER-TUM*	olive
GIŠMA	fig
GIŠGEŠTIN.È.A	raisin
GIŠ*ḫa-aš-ši-ik-kaǹ*	. . . .
GIŠ*ša-am-ma-ma*	. . . .

2. KUB XXIX 1 iv 4 ff.

Ì.ŠAḪ	lard
LÀL	honey
GA.KIN.AG	cheese
EM-ṢÚ	rennet(?)
(SÍG BABBAR	white wool)
(SÍG MI	black wool)
BAPPIR	'beer bread'
BULÙG	malt
GIŠ*ša-ma-ma*	. . . .
GIŠGEŠTIN.È.A	raisin
GIŠ*le-e-ti*	. . . .
GIŠ*šu-wa-i-tar*	. . . .
(KUŠ.GUD	cowhide)
MUN	salt

[8] For the restoration, raisin or grape, see above, n. 1.

[9] For this restoration see below, n. 13.

[10] Cf. *HW* 178. The passage closest to ours is *RHA* 77, 161 B ii 5, where the god is invited to "eat the smooth, hot, *šakuwant*-[. . .]"—the name of the food being lost! Should this *šakuwant-* turn out to be the same as the participle "seen, visible" one might think of "conspicuous, beautiful, pleasing" or the like.

[11] It is hard to understand why W. von Soden listed this word from this text in *AHw* under *littu*(*m*) III "stool"—albeit with the question "dazu?" Equally unjustified is Otten's transliteration as Akkadogram, *HTR* 134. That it is a Hittite *-i* stem is shown by the occurrence of the nominative form in *-iš*, KUB XXXIII 74 i 8 (*RHA* 77, 165, 17), common gender, as against endingless neuter in *-i* in the other texts. See already Laroche, *RA* 52 (1958) 188 (*HW*, 2. Erg. 17).

[12] Ingeniously reconstructed from broken texts by Laroche, *RHA* 77, at the passages quoted and p. 144 (note 13 below). Is this, despite the *-r-*, to be connected with the verb *lila*(*i*)-, *HW* 2. Erg. 17?

[13] Another broken text, KUB XXXIII 38 col. i (*RHA* 77, 144), seems to have a comparable combination of spells: *lilareš*[*kiddu*] calls for the restoration of *liti*, and *šakuwan* recalls *šamama* in the Telipinu text just discussed. What follows (in lines 6-8) shows that that text should indeed be restored in the form of a comparison (n. 9 above).

Otten, *HTR* p. 134, quotes the following from unpublished ritual texts:

3. 634/b, 6 f.
(measured by *se'a*)

$^{\text{GIŠ}}$MA	fig
[. . . .]	
$^{\text{GIŠ}}$*ša-am-ma-ma*	. . . .

4. 139/d i 8 ff.
(measured by handful)

[. . . .]	
$^{\text{GIŠ}}$GEŠTIN.È.A	raisin
$^{\text{GIŠ}}$*ZERTUM*	olive
$^{\text{GIŠ}}$*NU*[*RMU*]	pomegranate
[. . . .]	
$^{\text{GIŠ}}$*ša-am-ma-ma*	. . . .
$^{\text{GIŠ}}$*le-e-ti*	. . . .

5. 110/e obv. 5

[. . . .]	
[$^{\text{GIŠ}}$GEŠ]TIN.È.A	raisin
$^{\text{GIŠ}}$*ZERTUM*	olive
$^{\text{GIŠ}}$*ša-ma-ma*	. . . .
$^{\text{GIŠ}}$*ḫa-ši-ig-ga*	. . . .

6. KUB XII 64, 1-4

[. . . .]	
$^{\text{GIŠ}}$*ḫa-aš-ši-i*[*g-ga*]	. . . .
$^{\text{GIŠ}}$*ša-ma-ma*	. . . .
NINDA *EM.ṢÚ*	sour bread
BULÙG BAPPIR	malt and 'beer bread'

In the ritual for the dead, *šamama* occurs in lists introduced by the heading "all fruit" in the sense of "fruit of all kinds." These are:

7. KUB XXXIX 7 ii 16 f., repeated ibid. 63 f. (*HTR* pp. 36, 40)

$^{\text{GIŠ}}$*IN-BI*$^{\text{ḪI.A}}$ (*ḫumanda*)	(all) fruit
$^{\text{GIŠ}}$MA	fig
$^{\text{GIŠ}}$GEŠTIN.È.A	raisin
$^{\text{GIŠ}}$*ZÉ-ER-TUM*	olive
$^{\text{GIŠ}}$*ša-ma-am-ma-an-za*	*š*.s (Luwian plural)
(var.: No. 8: $^{\text{GIŠ}}$*ša-am-ma*[-. . .]; ii 64: $^{\text{GIŠ}}$*ša-ma-ma*)	
$^{\text{GIŠ}}$ḪAŠḪUR	apple
$^{\text{GIŠ}}$ḪAŠḪUR.KUR.RA	'mountain apple' (= ?)

8. KUB XXXIX 21 i 10 f. (*HTR* p. 88)

IN-BI$^{\text{ḪI.A}}$ *ḫuman*	all fruit
$^{\text{GIŠ}}$[. . . .]	. . . .
. . . .	
$^{\text{GIŠ}}$ḪAŠḪUR.KUR.RA	'mountain apple'
$^{\text{GIŠ}}$*ša-am-ma-m*[*a*]	. . . .

9. There is another list which requires some comment. In KBo X 34 col. i, $^{\text{GIŠ}}$*šamama* occurs in lines 18 and 24, but the seeming third occurrence in line 14 is a copying mistake of mine which should be corrected. The tablet has *ša-ma-iz-na-aš*, as clearly visible on the photograph.[14] The passage, lines 11-25, is divided by horizontal rules into four lists.

The *first* of these deals with different kinds of bread, the last of which is honey bread. The phrase which follows, *kuišša para* (or *kuitta para*, depending on the gender), literally "each one out," is often used in such listings in the sense of "und zwar, namely, including the following items," or the like. It is here followed by a list of words in the genitive indicating the materials from which the breads are made; whether this refers to several of the bread names which precede it or only to the last, NINDA.LÀL, remains open. The materials enumerated are:

ZÍZ "wheat,"[15] *ḫaršanila-*, *euwan-*, *parḫuena-*, GÚ.TUR "peas," GÚ.GAL.GAL "chickpeas (? or: beans?)," *ša-ma-iz-na-*, $^{\text{GIŠ}}$*ḫa-aš-ši-ig-ga-*, and *ša-ap-ša-ma-*.

The *second* section (15-18) lists "all fresh (and) dried fruit" $^{\text{GIŠ}}$*IN-BU ḫuman RA-AṬ-BU ŠA-BU-Ú-LU* "namely, of each a little: fig, raisin, olive, *paizzinna-*, *warawara-*, apple, 'mountain apple,' $^{\text{GIŠ}}$*zu-u-pa*,[16] $^{\text{GIŠ}}$*dammašḫuel*, pomegranate, grape (here without È.A!), $^{\text{GIŠ}}$*ša-ma-ma*."

In the *third* listing, the decisive first word (line 19) is not clear; does it begin with [DU]G? Does it refer to juice? At the end of the paragraph we

[14] Against an "emendation" of *iz* into *ma* (i.e., assuming a "mistake" of the scribe which my miscopy would have "corrected") is the occurrence of [. . . *š*]*a-am-ma-iz-zi-li-iš* in line 25, where *iz* before *zi* is in order. I am unable to offer an interpretation for either of these groups of signs. An "emendation" of *am-ma* to *ne* is, again, contradicted by the simple *ma* of line 14. Besides, **šamamanaš* would be the only example for the omission of GIŠ and for an *-n* stem!

[15] I cannot go into details here; but since ZÍZ is the most common bread cereal of the Hittites, and since the texts never have GIG for "wheat," whereas real wheat is archaeologically attested even for pre-Hittite times in central Anatolia, I think that ZÍZ, in Hittite texts, cannot be limited to the meaning "emmer wheat."

[16] Since Akkadian *zūpu* "origanum" (or "hyssop," *HW* 2. Erg. p. 34 without reference) is not a fruit but an herb, written with SAR, attested only once in a late text and suspect of being a loan from Aramaic (see *CAD* for this information), it cannot be meant here. We therefore take $^{\text{GIŠ}}$*zupa* as Hittite name, in the neuter plural form, of a fruit.

read *memal ŠA* $^{\text{GIŠ}}$*IN-BI* "meal of fruit;" is this an item by itself or a description of what precedes? The list itself, again in the genitive, is: "of apples, of figs, of raisins, of pomegranates, of [$^{\text{GIŠ}}$]*ḫatalkešna-*, of *euwan-*."

The *fourth* is a list of "roasted" items ([*š*]*anḫunta*). They are: [*ḫarš*]*aniliš*, *euwan*, *parḫuenaš*, GÚ.GAL.GAL, [GÚ.TUR], $^{\text{GIŠ}}$*ša-ma-ma duwarnanda* "broken *š*.s," GIŠ.KÍN.ḪI.A *duwarnanda* "broken *k*. s."[17] After a short break there follows "[. . . *š*]*ammaizziliš* (see n. 14 above), filled."

From these lists we learn the following about *šamama*:

a) It is consistently written with GIŠ, the determinative commonly used for trees and fruit of trees.

b) While in the first few lists it is associated with other ingredients as well as with fruit, it is expressly subsumed under the heading *INBU* in lists Nr. 7 and 8. In list 9 it appears among "fresh and dried fruit" and again under the heading "roasted ones," but is not found among the ingredients used for breads.

c) The last section of list 9 speaks of "broken" *š*. This brings us to another passage which requires some discussion. In KUB XXXIII 68 ii 7 ff. (*RHA* 77, 128) we read:

(7) *nu* $^{\text{GIŠ}}$MA *maḫḫan andurza LIM* NUMUN-*an*
ḫarzi
(8) *ziga ŠÀ-it aššu ud-da-a-na-za ḫark*
$^{\text{GIŠ}}$*ša-ma-ma* (9) *maḫḫan duwarnizzi*
nu pár-aš-te-ḫu-uš (10) *peššiezzi*
kardiya-tta-ma-at-kan šara danzi /
(11) *ziga* $^{\text{d}}$U *idalu ud-da-a-ar arḫa peššiya*
(12) *nu-za aššu ud-da-a-ar da-a* /

Despite the difficulties of this text we may venture the following translation:

Just as the fig has a thousand seeds inside,
(thus) hold thou (o god) good words(?)[18] in thy
heart!
Just as he[19] breaks the *šamama* and throws away
the *p*.s (= shells?),
and they lift it up to thy heart,
(thus) throw thou, o Storm-god, away the evil
words
and take the good words!

(The next sections use the well-known similes of the raisin holding wine and the olive holding oil, as tabulated above; there follows the section with GIŠ.KÍN discussed in n. 17 above.)

It was this passage in conjunction with the observations mentioned before which made me think of some kind of nut: *šamama* is the fruit of a tree, it contains oil, and something is thrown away[20] when it is broken. This leaves open the question of which kind of nut or nut-like fruit *šamama* may be: walnut, hazelnut, pistachio, almond; all grow in Asia Minor.

In view of the difficulties encountered in the interpretation of this passage (XXXIII 68 ii 7 ff.) it is better not to put too much emphasis on what may be the cracking of shells! There is, however, another observation to which the lists give rise:

d) The sequence of fruits and other ingredients is by no means fixed, a fact which makes all conclusions based on sequence alone rather hazardous. Now Otten's main argument was the "Nebeneinander beider Begriffe" (*HTR* 134), viz., the combination of *ḫaššikka* — *šamama* (XII 26, our No. 1; add Nr. 6) or *šamama* — *ḫaššikka* (110/e, No. 5) on the one hand, and NINDA.LÀL *ḫaššiggaš* and NINDA.LÀL ŠE.GIŠ.Ì on the other.[21] However, we observed that *šamama* is not

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[17] GIŠ."ḪAR" must here be the name of a fruit (or tree). For GIŠ.KÍN = *kiškanû* see *AHw* s. v.; another occurrence seems to be KUB XXXIII 68 ii 18 (*RHA* 77, 128 f.) with (Hittite?) complement -ri: "Whoever speaks evil to the dear Storm-god about the king and queen, *nan* GIŠ.KÍN-*ri du-ud-du-uš-x*[. . .-*d*]*u*? (I cannot restore or translate this); whoever speaks a harsh word to you, o [Storm-]god, give ⟨him⟩ a [. . . . .] 'mountain apple'; whoever [. . . .] a sour [. . . .] to the Storm-god, give him a sour apple, o Storm-god!" Here the mention of two other kinds of fruit in the next clauses makes *kiškanû* more likely than GIŠ.ḪUR = *uṣurtu*.

[18] Assuming a mistake for *ud-da-a-ar*, as lines 11 and 12 actually write. An ablative here seems out of place.

[19] Who is meant? The officiating priest? Or the patron of the ritual? For the general subject Hittite normally uses the 3d pers. plur., as found here in line 10. To take *šamama* here as subject (verb form in the sing. would be in order after a neuter plur.) would imply intransitive use of the active form of *duwarna*(*i*)- ("as the *š*.s pop and shed the *p*.s"), a use for which there is to my knowledge no other example.

[20] Apart from the hard shell, one might think of the fleshy outer shell of a walnut (if this is what the *šamama* is). Is there any connection between *par*(*a*)*šteḫa-* and *paršdu-* "sprout, shoot"?

[21] In Bo 2040 rev. 15 f. In the duplicate, KUB XXVII 19, 3, only the first term is preserved; there is space of undetermined length available for the restoration of

among the ingredients used for bread (or honey bread alone) in our text No. 9, first section. But just there, at the end of the list (KBo X 34 i 14) and following *ḫaššiggaš*, we find a word (in the genitive) *šapšamaš*!

Now it seems obvious that, once it had been noted that *šamama* contains oil, the similarity of sound between *šamama* and Akkadian *šamaššammu* played its part in the proposal that *šamama* be sesame. But the assonance is not very close, especially in view of the fact that the Hurrian form is *šumišumi*.[22] *šamama* lacks the second *s* found in all other forms of this international word. It seems to me that the *šapšama-* of KBo X 34 i 14 has a much better chance of being the Hittite name of the sesame, for the following reasons:

1) The assonance with *šamaššammu*, *šumišumi* is closer;
2) it does not have the determinative GIŠ;
3) in contrast to *šamama* it is used for honey bread, and
4) its position after *ḫaššikka-* corresponds exactly to that of ŠE.GIŠ.Ì in Otten's text.[23]

the second. The parallel text KUB XXXII 128 i 5 simply says "all (kinds of) honey bread" without naming them. The wording in *HW*, 2. Erg. 22: "wechselt in Paralleltexten mit (dem) Idgr." puts more into Otten's statement than what the facts warrant.

[22] Known from the Ras Shamra vocabulary: Thureau-Dangin, *Syria* XII (1931), text No. 8 on pp. 234 ff. and Pl. L-LII, col. ii 11 on p. 238, corresponding to *Ḫḫ* II 124 (*MSL* V p. 61). *HW* 325 and *HTR* 134, n. 3, quote secondary literature.

[23] It must be stated that at the time of Otten's writing the tablet KBo X 34 had not yet been excavated, so that he could not know about *šapšama-*.

What, then, is GIŠ*liti-*/*leti-*? Also a fruit, different from both *šamama* and the olive, and one whose product can be used for anointing. Thus the almond offers itself as a candidate, since almond oil is known for its cosmetic use. It is clear that this is no more than a possibility; the evidence is not sufficient really to determine the nature of *liti-*.

If we may sum up our conclusions, even though they are only tentative, we have the following oil producing plants in the Hittite texts:

GIŠ*SERDU*,	the olive;
GIŠ*šamama*,[24]	a kind of nut;
GIŠ*liti-*,	perhaps the almond;
ŠE.GIŠ.Ì,	probably read *šapšama-* in Hittite, "sesame" according to the traditional translation.

[24] In all places known to me ending in *-a*. According to the participle *duwarnanda* in KBo X 34 i 24 we are safe in taking this for neuter plural. Once there occurs a Luwian plural in *-anza* (above, list 7). Other occurrences, which have no immediate bearing on the discussion, are:
KUB XXXI 79, 3 (letter about transport by boat) may be restored as [. . . . . AD].KID GIŠ*ša-ma-ma na-aš up-p*[*í* . . .] "[(so and so many containers) of wick]erwork (filled with) *šamama*: dis[patch] them!"
KUB XXXIII 34 obv. 8 (*RHA* 77, 127): GIŠ*ša-ma-ma-kán wa-ar-aš-t*[*a*] "he harvested *š*.s."
KUB XXXIV 80 obv. 9: *naš* GIŠ*ša-ma-am-ma ki-i-ša-ru* "let him become, turn into, *š*." The parallel paragraphs have "let him turn into a fish" and "into the river Maraššandaš," respectively. Does line 10 contain the verb [*li-*]*le-e-ia-ru* from *lilai-*, discussed in n. 12 above?

INDIVIDUAL PRAYER IN SUMERIAN: THE CONTINUITY OF A TRADITION

WILLIAM W. HALLO [1]
YALE UNIVERSITY

I. A Sumerian Psalter?

SINCE THE FIRST PSALM STUDIES of Hermann Gunkel at the beginning of this century, the exegesis of the Biblical Psalter has accorded an ever more prominent place to the comparison of the hymns and prayers of the cuneiform tradition of ancient Mesopotamia.[2] As early as 1922,

[1] Originally presented, under the title of "The Psalter of the Sumerians," to the Philip W. Lown Institute of Advanced Judaic Studies, Brandeis University, November 2, 1966.

[2] For exhaustive bibliographies of current psalm exegesis, cf. the periodic surveys in *Theologische Rundschau* n.F. 1 (1929, by M. Haller), 23 (1955, by

Urartian Plant Cultivation at Yoncatepe (Van), Eastern Turkey
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Urartian Plant Cultivation at Yoncatepe (Van), Eastern Turkey[1]

EMEL OYBAK DÖNMEZ[2,*] AND OKTAY BELLI[3]

[2]Department of Biology, Faculty of Science, Hacettepe University, 06800, Beytepe, Ankara, Turkey; e-mail: polen@hacettepe.edu.tr
[3]Director of the Institute of Eurasian Archaeology, İstanbul University, 34459, İstanbul, Turkey; e-mail: obelli@istanbul.edu.tr
*Corresponding author

Urartian Plant Cultivation at Yoncatepe (Van), Eastern Turkey. Plant remains were recovered from an Urartian settlement, Yoncatepe, situated in the Van province of eastern Turkey and dating to the Iron Age period (first millennium B.C.E.). Large quantities of hulled barley (*Hordeum vulgare* L.) and of bread/macaroni wheat (free-threshing wheat) (*Triticum aestivum* L./*T. durum* Desf.), both mixed with small quantities of domesticated emmer wheat (*T. dicoccum* Schübl.), were found in the storerooms of the Yoncatepe palace, indicating the storage of agricultural surplus. Rye (*Secale cereale* L.) grains occur very occasionally, while pulses include lentil (*Lens culinaris* Medik.), chickpea (*Cicer arietinum* L.), and bitter vetch (*Vicia ervilia* [L.] Willd.). Grape seeds unearthed in a tomb at Yoncatepe provide physical evidence supporting written records of vineyards. Numerous seeds of gold of pleasure (*Camelina sativa* [L.] Crantz), found in a storage vessel, provide evidence of the cultivation of this plant. It is likely that the Urartians used the seeds for oil extraction.

Key words: Urartu, archaeobotany, palaeoethnobotany, storage, Yoncatepe, Anatolia, Iron Age.

The Iron Age kingdom of Urartu covered a large part of eastern Anatolia, Transcaucasia, and western Iran from the ninth century to the seventh century B.C.E., and was characterized by a high level of political organization. Crop husbandry and stock-breeding were of primary importance in the Urartian economy (Zimansky 1998). The authority of the rulers rested in large measure on their ability to command supplies of agricultural products extracted from their territories. Some agricultural activities of the kingdom are documented historically in cuneiform inscriptions; these also document the fact that successive kings dug vast irrigation canals and built reservoirs to increase the country's fertility and to supply the towns with water (Belli 1999; Burney 1972).

The archaeobotany of Urartian sites located outside the present frontiers of Turkey has received some attention from research workers (Zimansky 1998). There are, however, only a few studies of Urartian plant-related activities in eastern Anatolia, such as those at Ayanis (near the city of Van) (Cocharro et al. 2001; Çilingiroğlu 2004) and Patnos (near the city of Ağrı) (Oybak Dönmez 2003).

This study reports on the analysis of carbonized plant remains recovered from an Urartian site, Yoncatepe, situated in Van province of eastern Turkey (Fig. 1). The site has been excavated under the direction of Prof. Dr. Oktay Belli since 1997 (Belli 2005; Belli and Konyar 2001, 2003).

The Study Area

The province of Van is situated in the east Taurus Mountains of eastern Turkey (Fig. 1). Yoncatepe lies 11 km southeast of the eastern shore of Lake Van. The site is located on a flattened conical hill at an elevation of 2051 m, overlooking the plain of Van. Mount Erek (3200 m) and Mount Varak (2800 m) surround the eastern side of the plain, blocking strong, cold winds blowing from

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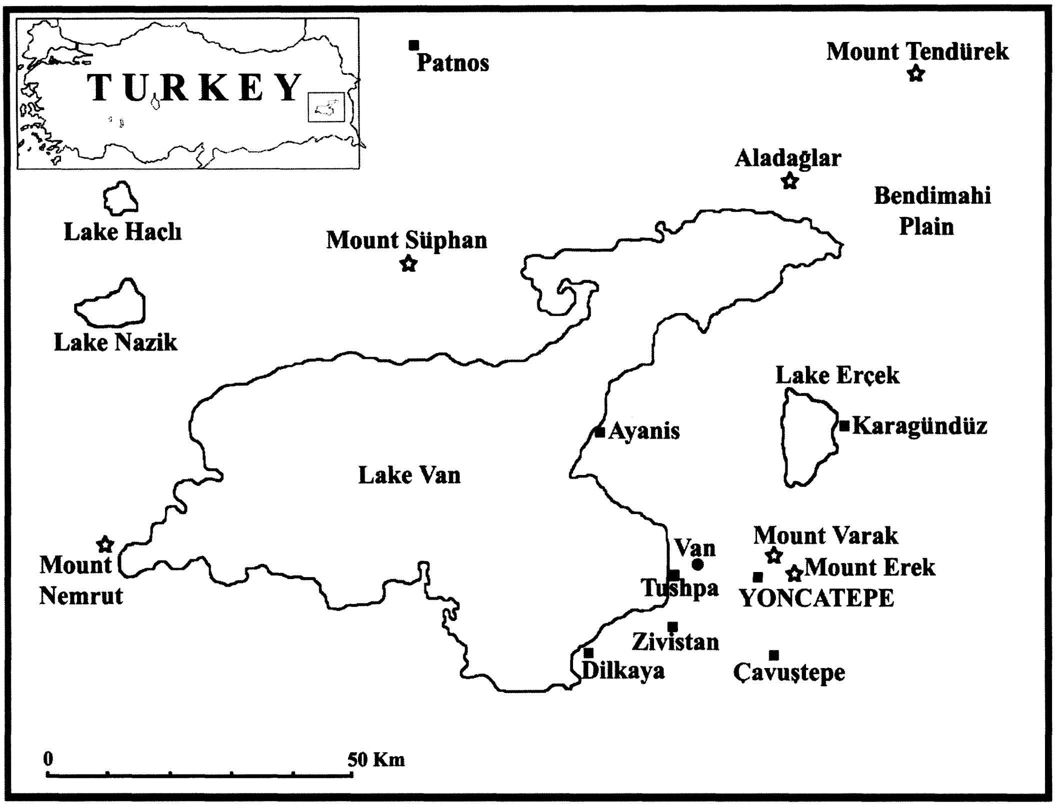

Fig. 1. Location map of Yoncatepe within the rectangle given in the top left and some of the sites mentioned in the text.

the east. In addition, the mountains have many natural springs; most of the water reaches the plain, supporting agricultural activities.

The sediments of Lake Van are an important resource for documenting vegetation and climate change in the region of Yoncatepe. A recent study of the annually laminated sediments from Lake Van spans about 13,000 varve years. It is based on high-resolution pollen, charcoal, isotopic, and geochemical analyses (Wick, Lemcke, and Sturm 2003). It shows that the Late Glacial period in the region was cold and dry, with steppe vegetation and saline lake water. Geochemical and isotopic records indicated a strong increase in moisture at the onset of the Holocene. This was associated with high fire frequencies and a rapidly rising lake level. At the same time, *Pistacia* L. and *Quercus* L. started to expand. The steppe-forest vegetation dominated by *Quercus* advanced at about 6200 B.P. After 4000 B.P., aridity increased again, and the modern climatic situation was established at about 2000 B.P. In the pollen diagram, human activity, recorded since 3800 B.P., is characterized by the decline of the forest elements and increase in herb pollen, dominated by *Plantago lanceolata* L.–type. Wick and colleagues found that human impact in the catchment of Lake Van intensified over the last 600 years (Wick, Lemcke, and Sturm 2003).

The present natural vegetation of the Van province is characterized mainly by the elements of the Irano-Turanian phytogeographic region (Koyuncu et al. 1999; Koyuncu, Demirkuş, and Alp 2005). Steppic formations that dominate the region include species of *Astragalus* L., *Acantholimon* Boiss., *Euphorbia* L., and *Verbascum* L. There is little woodland in the province, possibly due to human activities.

Today, the climate of Van province is continental with long and cold winters and warm summers (Koyuncu et al. 1999). The mean annual precipitation is 300–400 mm, most of which falls in the spring and autumn. The mean annual temperature at Van is 8.8 °C, being 14.7 °C in

the warmest months (July and August) and 3 °C in the coldest months (January and February).

The Yoncatepe Site

The Yoncatepe excavations conducted by Belli since 1997 have been carried out in the three main areas of the site: the palace in the acropolis, the lower settlement, and the necropolis.

Palace

The palace occupies the highest part of the settlement, covering an area of approximately 2650 m^2. The remains indicate that the palace was a two-story building. The walls of the first floor were made of stone slabs, while those of the second floor were made of mud-brick. The same construction techniques can still be seen today at village of Bakraçlı, located only 1 km northeast of Yoncatepe.

The palace was damaged by a catastrophic fire. The destruction was most probably the result of a Scythian attack, as evidenced by Scythian bronze arrowheads unearthed on the slopes of the acropolis (Belli 2006a). Most of the finds were severely damaged due to collapse of the second floor during the fire. No skeletons were found, and it appears as if the inhabitants abandoned the site suddenly.

Several rooms were excavated in the palace. We interpret some of them as storerooms, because they contain numerous large and small vessels, including *pithoi* (large storage jars), jars, and jugs. The vessels would have stored crops, food, and liquids. A kitchen on the western side of the palace was identified by its installations: several hearths, a mortar, and a basin. In addition, many jars, jugs, pots, and plates were recovered in this room. Archaeobotanical remains from the palace come from deposits that were burned during the fire.

Lower Settlement

The lower settlement lies on the northern side of the palace and in the east of the necropolis. The walls of the rooms in the area exposed so far were made of stone slabs and a soil mixture. Many pieces of ceramic vessels were also recovered. The quality of the architecture and the pottery in this area shows that this place was a civilian settlement. No samples were taken from the lower settlement.

Necropolis

The necropolis area where several tombs were found is located on the northern side of the palace. In the tombs, large amounts of pottery, iron, and bronze ornaments, iron weapons, and bones of sheep, cattle, and dogs were uncovered.

It is not yet known when the Yoncatepe palace was built. No texts were recovered. However, it appears that Yoncatepe and its environs were important places during Urartian time, as indicated by the incised building inscriptions belonging to the Urartian king Menua (810–786 B.C.E.) which were reused on the walls of the Yedikilise (Varak Church) at the village of Bakraçlı (Belli and Konyar 2001). It is certain that the palace was never resettled after it was demolished by the Scythians at the end of the seventh century B.C.E..

Today, the hill where the study site is situated is called "Yoncatepe" because clover (*yonca* in Turkish) was intensively grown as a fodder plant on the surrounding slopes by the villagers of Bakraçlı in the recent past. Today, bread wheat for food, barley and clover for fodder, and some fruit trees are grown locally. According to the villagers, barley was also used for breadmaking in the area until the 1940s.

Material and Methods

The Yoncatepe archaeobotanical samples were taken from various contexts, mostly silos or jugs recovered from burnt levels at the palace. A total of 25 samples were taken. Only large samples were sieved manually to remove soil particles. Charcoal pieces were separated and deposited for later examination by a wood anatomist. Twelve samples yielded seeds. Dates for these samples have been estimated, based on the associated archaeological finds. The plant remains in small samples (Samples 2, 5, 6, 9, and 12) were counted. For samples representing larger and mixed deposits (Samples 1, 3, 4, 7, 8, 10, and 11), minor and major components were separated after the examination of each sample. Numbers of minor components have been directly scored. About 1,000 grains of major components have been randomly taken and analyzed to estimate the quantities of grain types on the basis of the weight of the bulk. Estimated quantities are indicated by asterisks in Table 1.

The indices (L:B and T:B ratios) for cereal grains were calculated by dividing the mean length (L) and thickness (T) values by the mean breadth (B) values, and then by multiplying by 100.

Photographs were taken with a digital camera connected to a stereomicroscope.

TABLE 1. QUANTITIES OF URARTIAN PLANT REMAINS FROM YONCATEPE.

	Palace					
Area	Eastern Silo Room	North-western Silo Room	North-eastern Silo Room	Northern Silo Room	Hall H7-I	Storeroom D-7
Sample No.	1	2	3	4	5	6
Context	Floor	Pithos 14	Floor	Pithos 6	Floor	Floor
Cereals (grain)						
Hordeum vulgare barley	164	982	53.300*	1.300.000*	2	1.600
Triticum aestivum/durum bread/macaroni wheat	4.438*	1	22.000*			
T. dicoccum emmer wheat	215		561*			
Legumes (seed)						
Lens culinaris lentil					1.200	
Vicia ervilia bitter vetch		1				
Weeds (fruit/seed)						
Cephalaria syriaca			1			
Chenopodium goosefoot		2				
Galium bedstraw		4			1	1

* Estimated quantities.

TABLE 1. (CONTINUED).

	Palace					**Necropolis**
Area	Storeroom F-8	Kitchen G-5		Room H-5	In Front of Northern Rampart Wall	Tomb M3
Sample No.	7	8	9	10	11	12
Context	Jug	Broken jug	Plate	Floor	Soil layer	Vessel
Cereals (grain)						
Hordeum vulgare barley		5.333*	7	12.410*	154.820*	
T. dicoccum emmer wheat			1			
Secale cereale rye				1	1	
Legumes (seed)						
Lens culinaris lentil			2.400		1	
Cicer arietinum chickpea						6
Fruits (seed)						
Vitis vinifera grape						6
Oil crops (seed)						
Camelina sativa gold of pleasure	33.000*					
Weeds (fruit/seed)						
Chenopodium goosefoot	86		7			
Galium bedstraw		1	8	3		
Lolium rye grass			18			
Polygonum knotweed	1					
Silene	19					

Results

The Yoncatepe archaeobotanical samples were dominated by hulled barley, with significant quantities of free-threshing wheat, emmer wheat, and lentil. A cache of gold of pleasure seeds was recovered in a jug. Pulses (chickpea and bitter vetch), grape, and rye with some weedy taxa were also recorded in small amounts. The quantities of the plant remains are given in Table 1. Table 2 presents the mean dimensions and indices for barley and wheat grains. The identification criteria for the plant remains are given below.

Cereals

Hordeum vulgare **L. (barley):** All grains are hulled (Fig. 2). Most are symmetrical, suggesting two-row barley.

Triticum aestivum **L./*T. durum*** **Desf. (bread/macaroni wheat):** The identification of free-threshing wheats to species is usually based on chaff remains. As there is no free-threshing chaff in the Yoncatepe samples, identification of these specimens is limited to *Triticum aestivum* /*T. durum*, based on the grains having rounded, uncreased flanks, rounded cross sections, and the greatest width at the embryo end (Fig. 3).

T. dicoccum **Schübl. (domesticated emmer wheat):** The ventral side is longitudinally straight or somewhat concave, and the dorsal side is distinctly curved (Fig. 4).

Secale cereale **L. (rye):** Only two grains were found. The grains have pointed embryo ends and truncated upper ends. The ventral side is slightly convex, with narrow furrow, and the dorsal side is laterally compressed (Fig. 5).

Pulses

Lens culinaris **Medik. (lentil):** The seeds are strongly flattened and edges are angled (Fig. 6). Measurements: 2.8–4 mm (diameter).

Cicer arietinum **L. (chickpea):** The seeds are angular with a prominent beak (Fig. 7). Measurements: 4.2–5.8 (length) × 4.4–5 (breadth) × 4.1–5.7 (thickness) mm.

Vicia ervilia **(L.) Willd. (bitter vetch):** Only a single seed was found. It is rounded and tetrahedral, sloping in side view (Fig. 8).

Fruit

Vitis vinifera **L. (grape):** The seeds are pear-shaped (Fig. 9). Measurements: 5.2–6.7 (length) and 2.5–4 (breadth) mm.

TABLE 2. THE MEAN DIMENSIONS IN MM AND INDICES FOR *HORDEUM* AND *TRITICUM* GRAINS.

	L	B	T	L:B	T:B
Hordeum vulgare	5.7	2.8	2.1	203	75
Triticum aestivum/ durum	4.2	3	2.2	141	73
T. dicoccum	5.6	2.8	2.1	194	75

*The number of measured specimens for each taxon is 100.
**Table key: B = breadth, L = length, T = thickness.

Oil Crop

Camelina sativa **(L.) Crantz (gold of pleasure):** Most of the seeds are either swollen, so that they appear oval in shape, or deformed due to charring (Fig. 10). Most have lost their seed coats (testa), but the surface of some is covered with small papillae. Measurements of well-preserved seeds: 2.1–2.5 × 1.2–1.7 mm.

Weeds

The weedy taxa recovered include *Cephalaria syriaca* (L.) Schrader, *Chenopodium* L. (goosefoot), *Galium* L. (bedstraw), *Lolium* L. (rye grass), *Polygonum* L. (knotweed), and *Silene* L.

Discussion and Conclusions

The pollen diagram from Lake Van constructed by Wick, Lemcke, and Sturm (2003) suggests that the interference of man with the natural vegetation in the region of Van had already begun by about 3800 B.P. (c. 1900 B.C.E.), well before the establishment of the Urartian kingdom. Archaeobotanical reports based on macroremains from Early Bronze Age sites in Van province—Karagündüz Höyüğü (Hala N. Barakat, personal communication) and Dilkaya Höyüğü (Nesbitt and Samuel 1996)—indicate that plant cultivation was well established in the region by the third millennium B.C.E. The abundant remains of bread wheat and hulled barley from the two sites give direct evidence of farming activities.

Large-scale storage of hulled barley, free-threshing wheat, and emmer grains in the palace deposits at Yoncatepe point to an agricultural economy based mainly on grain production during Iron Age times. The Van plain may have offered well-watered and fertile soil for cultivation of crops. Archaeobotanical information from other Urartian settlements in eastern Anatolia, such as

Fig. 2. Grains of barley.

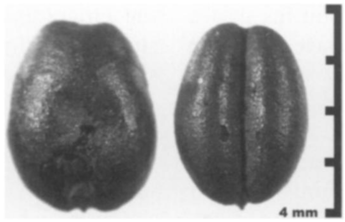

Fig. 3. Grains of bread/macaroni wheat.

Fig. 4. Grains of emmer wheat.

Fig. 5. Grains of rye.

Fig. 6. Seeds of lentil.

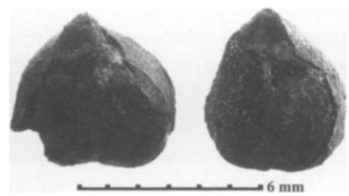

Fig. 7. Seeds of chickpea.

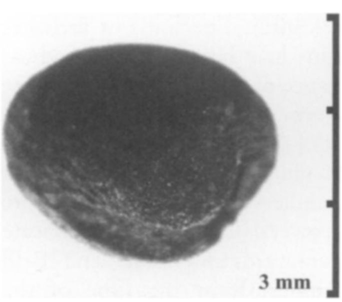

Fig. 8. Seeds of bitter vefch.

Fig. 9. Seeds of grape.

Fig. 10. Seeds of gold of pleasure.

Patnos near the city of Ağrı (Oybak Dönmez 2003), Çavuştepe (Oybak Dönmez, and Belli, in preparation), and Ayanis (Çilingiroğlu 2004) in the region of Van, and those outside the present border of Turkey (Tumanian 1944; Zimansky 1998) also suggest that cereals, including barley, wheat, rye, and millet (*Panicum miliaceum* L.), were the principal crops of Urartian agriculture.

According to Çilingiroğlu (2004), cereals also appear to have played an important role in the religious rites of the Urartians. Based on the botanical remains found in association with the archaeological finds recovered from the temple at Ayanis, he writes that cereal grains may have been used as the ritual offerings to the god Haldi and that the grains may be related to fertility cult.

The presence of large storerooms in the palace at Yoncatepe shows that it must have been the place where agricultural surplus was stored. This reflects an elaborate system of food storage and palace economy.

At Yoncatepe, hulled barley appears to be of great importance. Most barley grains seem to have been stored separately (Samples 2, 4, 6, 8, and 10). Sample 1 and Sample 3 contain a mixture of barley and wheat grains, possibly due to the mixing of the contents of different storage containers during the destruction of the buildings caused by the fire. An almost pure deposit of barley grains was scattered over the soil layer in front of the northern rampart wall of the palace, again possibly due to the destruction of the buildings (Sample 11). Barley is also the dominant crop at some other Anatolian Iron Age sites: Troy VIIb (1190–950 B.C.E.) and Miletus (750–650 B.C.E.) in the west, and Gordion (700 B.C.E.) in central Anatolia (Riehl and Nesbitt 2003).

Today barley is grown in most areas of the temperate regions for animal feed and for brewing, but the abundance of barley in archaeological deposits, often in kitchens, shows that it was an important food, and was used for both porridge and bread in the past (Nesbitt 2005). In the account of the Turkish agricultural system in the 1920s, Zhukovsky (1951) recorded that barley was of secondary importance after wheat, and was grown throughout the country, especially in villages at high elevations. He also noted that people in eastern Anatolia used barley for the production of bread as well as for fodder. It seems that, in the Yoncatepe area, barley's role as a staple food had disappeared since the 1940s.

Bread/macaroni wheat is more abundant than emmer in the Yoncatepe samples (Samples 1 and 3). Emmer grains were also recorded from Patnos in eastern Turkey (Oybak Dönmez 2003) and from Karmir Blur on the outskirts of Yerevan (Armenia) (Bedigian 1985). However, emmer wheat appears to be present only as a minor contaminant of other crops, reflecting a major decline in importance since earlier prehistory. Given the high elevation and harsh environmental conditions of the Urartian lands, emmer wheat, which is hardier than the naked wheats, may have been tolerated to help avoid total crop failure.

Rye grains occur very occasionally in the barley samples of Yoncatepe. Considering the scarcity of the rye remains, a reasonable assumption would be that rye infested the barley fields and entered the agricultural production during harvest in the study area. However, it should be taken into consideration that the grains found at Yoncatepe show typical features of the cultivated type. Based on the archaeobotanical data from Karmir Blur, Bedigian (1985) reported that the Urartians cultivated rye.

On the whole, pulses, namely lentil, chickpea, and bitter vetch, are less abundantly represented in the Yoncatepe samples. The lentil samples were recovered on the hall floor (Sample 5) and on a plate under a jug in the kitchen (Sample 9).

The scarcity of pulse seeds does not necessarily indicate a minor role in the economy. These pulses, as companions of wheat and barley, appear in the Near East settlements from the beginning of agriculture in the Neolithic period (Zohary and Hopf 2000). Chickpea was recovered from some other Urartian settlements, such as Karmir Blur (Bedigian 1985) and Bastam in Nahcivan (Hopf and Willerding 1988). Chickpea, along with bitter vetch, was also recorded from the Iron Age levels of Troy (VIIb) and Gordion, and of Tille Höyük (700 B.C.E.) on the Euphrates in southeast Anatolia (Riehl and Nesbitt 2003).

The few chickpeas and grape seeds found inside a vessel in Tomb M3 (Sample 12) are apparently funerary offerings. All the seeds were carbonized, possibly due to the cremation practice (disposing of a corpse by burning) as inferred by Belli and Konyar (2001). The finds of archaeological plant remains may be taken as an indication of the importance of these plants in Iron Age times in the study area. Grape is found in ancient texts and images that point to common use and cultivation of the vine in the Levant from (at least) the third millennium B.C.E. (Postgate 1987). Moreover, several Urartian texts indicate that they planted vineyards and made wine (Belli 2006b). An inscription from the time of the Urartian king Išpuini (830–810 B.C.E.) on a rock face found at the Zivistan (Elmalı) village, located some 18 km south of Tushpa, records that the son of Sarduri I, Išpuini, built a vineyard and an orchard in the area. In the present day, Iron Age terraces are, indeed, still discernible in the vicinity of the rock face. Rock inscriptions say that vineyards were also built in the name of the god Haldi for good yields and that libations of wine were offered to the gods. A rock inscription in the Bendimahi Plain lying to the northeast of Lake Van records the planting of a vineyard for

king Menua himself, which was called "Vineyard of Menua." The remnants of the walls of the Menua's irrigation canal, built about 14 km south of Tushpa, bear several inscriptions. One inscription says that Menua planted a vineyard for his wife, Tariria. Today, viticulture is still practiced in the area and the local grapes are regarded as an especially delicious product of the Van region.

Noteworthy is a cache of gold of pleasure seeds, contaminated with some weedy taxa, recovered in a jug found in Storeroom F-8 (Sample 7) at Yoncatepe. Sesame (*Sesamum indicum* L.) has been usually reported as the major oil crop in Urartian agriculture (Bedigian 1985). The concentration and storage of oil-containing seeds of gold of pleasure at the Yoncatepe palace, however, suggest that the Urartians also cultivated this oil crop plant. The seeds may have been processed for oil extraction. The species has previously been reported in many Neolithic and Bronze Age sites in the Eastern Mediterranean (Riehl 1999). For example, the seeds of gold of pleasure were recorded from Middle Bronze Age Troy (Troy IV) by Riehl (1999) and Late Bronze Age Hadidi on the north Syrian Euphrates near the Syrian-Turkish border by van Zeist and Bakker-Heeres (1985). According to Zohary and Hopf (2000), the Iron Age finds of this plant are more numerous.

The weedy taxa, such as bedstraw, rye grass, and knotweed, may have arrived on the site as weeds of cultivated fields.

In conclusion, the archaeobotanical assemblage of the Yoncatepe site indicates that the inhabitants cultivated hulled barley, free-threshing and emmer wheats, lentil and chickpea, and grape in the Iron Age. Crop cultivation may also have included rye and bitter vetch at that time. One of the remarkable contributions of this study is the find of oil-containing seeds of gold of pleasure in a storage vessel. This find provides a new insight into the oil plants used by the Urartians.

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ETHNOBOTANCAL STUDIES IN THE VILLAGES OF THE DISTRICT OF ILICA (PROVINCE ERZURUM), TURKEY[1]

UFUK ÖZGEN, YUSUF KAYA, AND MAKSUT COŞKUN

Özgen, Ufuk *(Atatürk University, Faculty of Pharmacy, Department of Pharmacognosy, 25240 Erzurum, Turkey, e-mail uozgen@atauni.edu),* **Yusuf Kaya** *(Atatürk University, Science and Art Faculty, Department of Biology, 25240 Erzurum, Turkey),* **and Maksut Coşkun** *(Ankara University, Faculty of Pharmacy, Department of Pharmaceutical Botany, 06100 Tandoğan, Ankara, Turkey).* ETHNOBOTANICAL STUDIES IN THE VILLAGES OF THE DISTRICT OF ILICA (PROVINCE ERZURUM), TURKEY. *Economic Botany 58(4):691–696, 2004. An ethnobotanical survey was made of the villages of the Ilıca District, Erzurum Province, Turkey. The authors interviewed 130 people in 60 villages. The information so obtained was classified according to the use of plants for food, fuel, dye, and construction materials, as well as for miscellaneous uses. All in all, this study revealed 60 plant taxa that were useful to the villagers of this district.*

Key Words: Ethnobotany; Erzurum; Turkey; useful plants.

The field of ethnobotany has seen many advancements over the past decade. New methods and theories have been introduced, and more and more attention is being given to the study of cultures in underdeveloped lands. Furthermore, the subject matter has been broadened to include data not only from anthropology and botany, but also from pharmacology and phytochemistry (Cotton 1997).

There are about 9500 species in Turkey, 30% of which are endemic (Davis 1988; Güner et al. 2001). As is the case elsewhere in the world, Turkish people have long utilized plants as remedies, food, fuel, and dye, as well as for furniture, ornamentation, agricultural tools, and construction materials. Ethnobotanical studies have been carried out in Turkey since the early years of the 19th century (Baytop 1984). A bibliography on this subject was published in 1997 by Alpınar and Saçlı. The Turkish Province of Erzurum, in this regard, has been little investigated with regard to its economically important plants (Başar 1972; Öztürk 1988; Sezik et al. 1997). Only two villages of the Ilıca District have been previously reported upon (Sezik et al. 1997). Although this study is part of a more comprehensive project that includes all of Erzurum, in this paper, priority is given to the description of the useful plants of the Ilıca District.

STUDY AREA

Erzurum Province, which is located in the East Anatolia subdivision (one of seven subdivisions of Turkey), is comprised of 18 districts. The district that is presented here, Ilıca, includes some 60 villages. Its total population was 35 300 in the year 2000. Its area covers 1702 km^2, and the elevation of its land varies from 1730 to 2300 m. Although the annual mean temperature is 5.9°C, temperatures may vary from −40°C to 34°C, and snow may cover the district from November to April. Distance between villages ranges from 3 km to 85 km. All villages are fairly similar with regard to the level of agricultural development, as well as social and economic life. The main occupations of the villagers are farming, stock breeding, and chicken production.

The Ilıca town center includes a sugar mill, a sunflower oil factory, a milk and milk products factory, and many small industrial establishments. None of the villages have any major industrial establishments. Because of the limited opportunities for employment, people often migrate from the smaller villages to the larger towns and cities.

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TABLE 1. THE PLANTS USED AS FOOD IN THE VILLAGES OF ILICA DISTRICT.

Family and species names	Local name	Parts used	Use application (voucher specimen)
APIACEAE			
Coriandrum sativum L.	Aş otu	Herb	As spice (ATA 9715)
Eryngium billardieri Delar.	Boğa dikeni	Stem	After bark is peeled (ATA 9726)
Eryngium campestre L.	Şeker dikeni	Stem	After bark is peeled (ATA 9705)
Opopanax hispidus (Friv.) Gris.	Kekire	Stem	After bark is peeled (ATA 9693)
Prangos ferulacea (L.) Lindley	Çaşir	Stem	After bark is peeled (AEF 21165)
ASTERACEAE			
Arctium minus (Hill) Bernh. subsp. *pubens* (Babington) Arénes	Kalağan Zirolik	Leaves	Cooked (AEF 21191)
Cirsium acaule (L.) Scop.	Gobuk	Stem	After bark is peeled (ATA 9719)
Inula thapsoides (Bieb. ex. Willd. Spreng) subsp. *thapsoides*	Yıldız kökü	Tuber	Eaten fresh (ATA 9720)
Onopordum acanthium L.	Kavlugan	Stem	After bark is peeled (AEF 21162)
Tragopogon buphtalmoides (DC.) Boiss. var. *buphtalmoides*	Yemlik	Leaves	Eaten fresh (AEF 21189)
Tragopogon aureus Boiss.	Yemlik	Leaves	Eaten fresh (ATA 9707)
BERBERIDACEAE			
Berberis integerrima Bunge	Kızambuk	Fruit	As pickled (AEF 21164)
Berberis vulgaris L.	Kızambık	Shoot	(ATA 9722)
BRASSICACEAE			
Nasturtium officinale R. Br.	Su teresi	Herb	Eaten fresh (AEF 21158)
Raphanus raphanistrum L.	Mamanik, yaban çeçi	Leaves	Cooked or eaten fresh (AEF 21180)
Sinapis arvensis L.	Mamanik	Herb	Eaten fresh (ATA 9717)
CAPRIFOLIACEAE			
Viburnum lantana L.	Germeşe	Fruit	Eaten fresh (AEF 21178)
CHENOPODIACEAE			
Beta lomatogona Fisch. & Mey. var. *lomatogona*	Kızılca	Leaves	Cooked (ATA 9709)
Chenopodium foliosum (Moench) Aschers.	İt üzümü	Fruit	Eaten fresh (AEF 21143)
CRASSULACEAE			
Sedum sempervivoides Bieb.	Horozlelesi	Leaves	Eaten fresh (AEF 21141)
Sedum album L.	Gelinparmağı	Leaves	Eaten fresh (ATA 9698)
CUPRESSACEAE			
Juniperus communis L. subsp. *alpina* (Sm.) Čelak. (=*J. communis* L. subsp. *nana* Syme)	Çeçem	Fruit	Eaten fresh (AEF 21145)
ELAEAGNACEAE			
Hippophae rhamnoides L.	Sincan, çalı, karaçalı, ekşi	Fruit	Eaten fresh (AEF 21142)
GROSSULARIACEAE			
Ribes biebersteinii Berl. ex DC.	Üzüm	Fruit	Each fresh or dry (AEF 21152)
IRIDACEAE			
Crocus flavus Weston	Yayla kovan	Whole plant	Eaten fresh (ATA 9727)

TABLE 1. CONTINUED.

Family and species names	Local name	Parts used	Use application (voucher specimen)
LAMIACEAE			
Mentha longifolia (L.) Hudson subsp. *longifolia*	Yarpuz	Herb	As spice (AEF 21152)
Salvia verticillata L. subsp.*verticillata*	Dadirek	Stem	Eaten after peeled (ATA 9728)
Thymus fallax Fisch. & Mey. *Thymus sipyleus* Boiss. Subsp. sipyleus var. sipyleus	Kekik otu Keklik otu	Herb	As spice (ATA 9706, ATA 9718)
MALVACEAE			
Malva neglecta Wallr.	Ebemkömeyi, Ebemkömeci, Ebemgümeci	Herb	Eaten fresh or cooked (AEF 21173)
POLYGONACEAE			
Polygonum cognatum Meissn.	Ebemekmeği, Kuşekmeği, Epenek	Leaves	Cooked (AEF 21177)
Rheum ribes L.	Işgın, Eşgin	Stem	After bark is peeled (AEF 21174)
Rumex crispus L.	Evelik	Leaves	Eaten fresh or cooked (AEF 21188)
Rumex scutatus L.	Kuzukulağı	Leaves	Eaten fresh (ATA 9696)
Rumex tuberosus L.	Kuzukulağı	Leaves	Eaten fresh (ATA 9695)
ROSACEAE			
Cotoneaster nummularia Fisch. & Mey.	Koyun gözü, Tavşan elması	Fruit	Eaten fresh or dry (ATA 9713)
Crataegus monogyna Jacq.	Alıç	Fruit	Eaten fresh (ATA 9714)
Rosa dumalis Bechst. subsp. *boissieri* (Crépin) Ö. Nilsson	Kuşburnu	Fruit	Eaten fresh (ATA 9712)
Rosa gallica L.	Kuşburnu	Roots	As tea
		Fruit	Eaten fresh, or in jam or marmalade (AEF 21151)
Rosa pimpinellifolia L.	Koyun gözü, Kara kuşburnu	Fruit	Eaten fresh (AEF 21147)
Rubus idaeus L.	Böğürtlen	Fruit	Eaten fresh (ATA 9711)
URTICACEAE			
Urtica dioica L.	Isırgan	Herb	Cooked (AEF 21172)

METHODS

The study was carried out during 1999–2000, in the period from June through October, when plants were in their flowering and fruiting periods. All villages of Ilıca were screened. A questionnaire form, which was prepared before the beginning of the study, was given to our informants. It asked for the person's given name, surname, age, and phone number. It also asked for his or her's knowledge concerning the common names of plants, their usage, and preparation. Information was collected from both the elderly and the young and from both men and women. The interviews were conducted in group sessions. The species were collected with the help of the informants, and identified in the lab. Voucher specimens of all recorded species were deposited in Ankara Üniversitesi Eczacılık Fakültesi Herbaryumu (AEF) and Atatürk Üniversitesi Fen Fakültesi Herbaryumu (ATA).

RESULTS

One hundred thirty people were interviewed in this study, and 350 voucher specimens were

TABLE 2. THE PLANTS USED AS FUEL IN THE VILLAGES OF ILICA DISTRICT.

Family and species names	Local name	Parts used	Voucher specimen
FABACEAE			
Astragalus barba-jovis DC. var. *barba-jovis*	Geven	Whole plant	AEF 21197
Astragalus microcephalus Willd.	Geven	Whole plant	AEF 21198
SALICACEAE			
Populus nigra L.	Kavak	Branch	ATA 9716
Salix armenorossica A. Skv. (=*Salix viminalis sensu* Boiss.)	Söğüt		AEF 21155
Salix cinerea L.			ATA 9699
Salix fragilis L.			ATA 9700
Salix alba L.			ATA 9701
SCROPHULARIACEAE			
Verbascum cherianthifolium Boiss. var. *asperulum* (Boiss.) Murb.	Sığır kuyruğu Gırç	Stem	AEF 21184
Verbascum cherianthifolium Boiss. var. *cataonicum* (Hand.-Mazz.) Murb.			AEF 21185
Verbascum cherianthifolium Boiss. var. *cherianthifolium*			AEF 21187
Verbascum vulcanicum Boiss. & Heldr. var. *vulcanicum*			AEF 21186

collected. Following the identification of the specimens in the lab, our field collections were found to contain 60 species belonging to 23 plant families. Some of the species were said by our informants to have been used for food, fuel, or dye, while others were said to have served for construction materials or other miscellaneous purposes. All informants were from villages in the Ilıca District.

The results of the fieldwork are presented in Tables 1–5. Ethnobotanical uses of plants are given under their family names, in alphabetical order. All species reported in Tables 1–5 were collected from natural habitats rather than cultivated fields, and all are known to have been recently utilized by villagers.

Five species in Table 1 were used for food in all 60 villages. These are *Malva neglecta* Wallr., *Rosa dumalis* Bechst. subsp. *boissieri* (Crépin) Ö. Nilsson, *Rosa gallica* L., *Rumex crispus* L., and *Urtica dioica* L.

Plant species used for fuel in the 60 villages surveyed included *Astragalus barba-jovis* var. *barba-jovis* and *Populus nigra* L., *Salix armenorossica* A. Skv. (= *Salix viminalis* sensu Boiss.), *Salix cinerea* L., *Salix fragilis* L., *Salix alba* L., *Verbascum cherianthifolium* Boiss. var. *asperulum* (Boiss.) Murb., *V. cherianthifolium* Boiss. var. *cataonicum* (Hand.-Mazz.) Murb., *V. cherianthifolium* Boiss. var. *cherianthifolium,* and *Verbascum vulcanicum* Boiss. & Heldr. var. *vulcanicum.* However, not all of the above species were utilized by all villagers. For example, 24 of the informants in the 60 villages used *Ver-*

TABLE 3. THE PLANTS USED AS DYE IN THE VILLAGES OF ILICA DISTRICT.

Family and species names	Local name	Parts used	Use and application (voucher specimen)
GERANIACEAE			
Geranium tuberosum L. subsp. *tuberosum*	Potot	Whole plant	It dyes black color (AEF 21150)
RUBIACEAE			
Rubia tinctorum L.	Bostanboyası	Roots	It dyes red color (ATA 9703)

TABLE 4. MISCELLANEOUS USEFUL PLANTS OF THE VILLAGES OF THE ILICA DISTRICT.

Family and species names	Local name	Parts used	Use and application (voucher specimen)
ASTERACEAE			
Artemisia austriaca Jacq.	Yavşan	Whole plant	As a broom (AEF 21139)
Chondrilla juncea L.	Süpürge	Whole plant	As a broom (ATA 9721)
CAPRIFOLIACEAE			
Viburnum lantana L.	Germeşe	Branch	To weave baskets (AEF 21178)
CRASSULACEAE			
Sedum album L.	Gelinparmağı	Whole plant	As an ornament (ATA 9698)
FABACEAE			
Astragalus microcephalus Willd.	Geven	Root	As gum (AEF 21198)
JUNCACEAE			
Juncus articulatus L. *Juncus effusus* L.	Camış otu	Shoot	To weave hats (ATA 9723, ATA 9724)
SALICACEAE			
S. armenorossica A. Skv. (=*Salix viminalis* sensu Boiss.)	Sorkun	Branch	To weave baskets (AEF 21155)
TYPHACEAE			
Phragmites communis Trin.	Sümbül	Stem	As an ornament (ATA 9704)

bascum spp. for fuel, whereas 30 used *Astragalus* spp., 8 used *Salix* spp., and only 4 used *Populus nigra.*

Two species used as dye plants, *Geranium tuberosum* L. subsp. *tuberosum* and *Rubia tinctorum* L., were reported from only 2 of the 60 villages studied (3.3%).

Several species were recorded as being used for more than one purpose. However, such multipurpose plants were not commonly reported by the villagers. Moreover, the authors were told that the use of such multipurpose plants has decreased markedly in recent years.

Wild plants were not considered to hold the same economic value as cultivated plants in the area studied. Only *Prangos ferulacea* (L.) Lindley, *Rheum ribes* L., *Crataegus monogyna* Jacq., *R. dumalis* subsp. *boissieri,* and *R. gallica* were sold in markets and public bazaars.

TABLE 5. PLANTS USED FOR CONSTRUCTION MATERIAL IN THE VILLAGES OF THE ILICA DISTRICT.

Family and species names	Local name	Parts used	Voucher specimen
SALICACEAE			
Populus nigra L.	Kavak	Stem	ATA 9716

Aside from the wild species reported here, the major food and fodder plants of the Ilıca District include wheat (*Triticum aestivum* L.), potato (*Solanum tuberosum* L.), sugar beet (*Beta vulgaris* L. var. *altissima* (Döll) Helm), corn (*Zea mays* L.), sunflower (*Helianthus annuus* L.), rye (*Secale cereale* L.), bean (*Phaseolus vulgaris* L.), lentil (*Lens culinaris* Medik.), carrot (*Daucus carota* L.), spinach (*Spinacia oleracea* L.), onion (*Allium cepa* L.), tomato (*Lycopersicon esculentum* Mill.), eggplant (*Solanum melongena* L.), saint-foin (*Onobrychis viciifolia* Scop.), vetch (*Vicia sativa* L.), alfalfa (*Medicago sativa* L.), and barley (*Hordeum sativum* Pers. (*H. vulgare* L.).

DISCUSSION

Our recorded information was compared with the results of studies by Başar 1972, Baytop 1984, Ertuğ 2000, Öztürk 1988, and Sezik et al. 1997. From Baytop (1984) we found that the local names for most of our species were identical to those used in other Turkish cities. However, some local names were very different from those previously recorded. In fact, some of the plant species recorded by us have vernacular names that represent new records for both the district and the national boundaries of Turkey,

including *Cirsium acaule* (L.) Scop. (Gobuk), *Chondrilla juncea* L. (Süpürge), *Cotoneaster nummularia* Fisch. & Mey. (Koyun gözü), *Geranium tuberosum* L. subsp. *tuberosum* (Potot), *Hippophae rhamnoides* L. (Sincan, çalı, karaçalı, ekşi), *Juncus articulatus* L., *Juncus effusus* L. (Camış otu), *Juniperus communis* subsp. *alpina* (Sm.) Čelak (Çeçem), *Phragmites communis* Trin. (Sümbül), *Raphanus raphanistrum* L. (Yaban çeçi), *Ribes biebersteinii* Berl. ex DC. (Üzüm), *Rubia tinctorum* (Bostanboyası), *Sinapis arvensis* L. (Mamanik), *Sedum album* L. (Gelinparmağı), *Sedum sempervivoides* Bieb. (Horozlelesi), and *Verbascum* spp. (Gırç).

Of the 60 species that were identified in this study, 42 (70%) were used for food, while 11 (18.3%) were used for fuel, and two were utilized (3.3%) for dye. One species (1.6%) was used for construction material. Nine species (15%) fell under the category of "multipurpose" plants.

The villagers used various parts of the plants for food. Of the 42 food plants that we identified, 12 (28.5%) were utilized by the natives for their fruit; whereas 11 (26%) were utilized for their leaves, 8 (19%) for their stems, and 7 (16.6%) for their edible aerial parts. One species each (2.3%) were used for their edible tubers, roots or shoots, while only one species was consumed whole, i.e., eaten in its entirety.

As pointed out earlier, ethnobotanical studies are becoming more popular throughout the world, and these studies are focused on documenting the traditional uses of plants by native cultures. Unfortunately, native people throughout the world are fast losing some of their most important traditions; and this includes the knowledge of how to recognize and use economically valuable wild plant species. For this reason, it is important that we collect and record information as soon as possible, and this process should be carried on in as many settings as possible. Not even one village should be neglected, since some information may vary from village to village, even when they are situated very close to one another.

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Ethnobotanical Aspects of Some Taxa in East Anatolia, Turkey[1]

Fevzi Özgökçe and Hasan Özçelik

Özgökçe, Fevzi *(Yüzüncü Yıl University, Faculty of Science and Arts, Department of Biology, 65080 Van-Turkey; e-mail: f_ozgokce65@yahoo.com)*, **Özçelik, Hasan** *(Süleyman Demirel University, Faculty of Science and Arts, Department of Biology, 32100 Isparta-Turkey)*. Ethnobotanical Aspects of Some Taxa in East Anatolia, Turkey. *Economic Botany 58(4):697–704, 2004. This paper presents a list of some medicinal plants distributed in the East Anatolia region. The list was prepared during an ethnobotanical survey of the region from 1995 to 2002. East Anatolia has a rich flora due to its variable climate and its many ecological zones. This diversity in flora provides a rich source of medicinal plants that has been long utilized by Anatolian cultures; and hence, accounts for the remarkable accumulation of medicinal folk knowledge for the region. This paper provides information about 71 useful plants grown in the region, 20 of which are reported for the first time. In addition to the scientific names, vernacular names and medicinal uses are given for each plant.*

1995–2002 yılları arası Doğu Anadolu Bölgesinde gerçekleştirilen etnobotanik taramalar sonucu, bölgede yayılış gösteren bazı tıbbi bitkiler bu çalışmada liste halinde verilmiştir. Değişik ekolojik durumlar, farklı iklimsel tipler ve vejetasyon geçmişinden dolayı Doğu Anadolu Bölgesi zengin bir floraya sahiptir. Farklı kültürlere ve zengin floraya sahip bölgede Halk hekimliği ile ilgili veriler çok fazladır. Bundan dolayı Anadolu tıbbi bitkilerin kullanımı bakımından önemli bir merkez olmuştur. Bu araştırmada bölgede yetişen değişik amaçlarla kullanılan 71 faydalı bitki hakkında bilgi verilmektedir. Kaydedilen verilerden 20'si ilk kez sunulmaktadır. Çalışmayı oluşturan bitkilerin tümü araştırma bölgesinden toplanıp teşhis edilmiş, yöresel isimleri ve tıbbi kullanımları verilmektedir.

Key Words: Ethnobotany; vernacular name; East Anatolia; Turkey.

East Anatolia is the largest geographical region of Turkey. Since the area is surrounded by coastal mountain ranges, it is shielded from the moderating effect of sea breezes. For this reason, winters are usually cold and long, and precipitation generally occurs as snow that lasts for several months. After a very short and rainy spring, a hot and dry summer follows (Tabata et al. 1994).

East Anatolia is too large an area to cover thoroughly, so folk remedies in the provinces of Van, Hakkari, Siirt, Batman, Bingöl, Tunceli, Erzurum, Erzincan, Elazığ, Malatya, Ağrı, Kars, Muş, and Bitlis were surveyed.

We concluded that folk medicine is still commonly practiced in East Anatolia because of its geographical remoteness from medical facilities and the difficulty of transportation during the long, cold winters. These factors explain the preservation of ethnopharmacological practices in the region.

People have been dealing with economically important plants since times immemorial. The large number of research studies we found on medicinal plants is proof of the interest in this type of work. About 800 000 plants are found in the world, with about 9000 of them found in Turkey. Those grown for food number about 3000, but if we consider wild plants used for food, the number increases to about 10 000. According to reports published by the World Health Organization, about 1900 plants are used as drugs; however, nearly 20 000 plants are used for this purpose. Of this larger number, 600 grow in Turkey (Öztürk and Özçelik 1991).

Several studies have been published recently on the ethnomedicine of Anatolia (İlçim and Varol 1996; Özçelik et al. 1990; Öztürk and Özçelik 1991; Sezik et al. 1991; Sezik et al. 1997;

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Tabata et al. 1994; Tonbul and Altan 1989; Yıldırımlı 1985). Furthermore, Ertuğ 2000 and Baytop's (1984, 1994) intensive research provided considerable information not only on medicinal plants, but also on edible plants, fodder, fuel, dyes, and gums. However, until now there was no ethnobotanical research available on the variety of plants used and consumed in one limited geographical area of Anatolia. The floral potential of one specific area in Anatolia and the richness of the traditional knowledge about plants have never been documented. Many more detailed studies are needed to obtain a comprehensive picture of plant-human interactions in Turkey.

Materials and Methods

The study materials consisted of medicinal plant samples, which were collected at various time periods from 1995 to 2002. The plant specimens were assigned collection numbers, and their localities and other necessary field records were recorded. The specimens were pressed, dried according to herbarium techniques, and identified using *Flora of Turkey and the East Aegean Islands* (Davis 1965–1985; Davis et al. 1988; Güner et al. 2000). All plant specimens were kept at the Yüzüncü Yıl University herbarium.

An alphabetical list of the plant taxa, including species and family, is provided in Table 1. The table also lists the plants' vernacular names, localities, plant parts used as a medicine, medicinal use, method of application, and collection number. Ethnobotanical properties of all 71 taxa listed in the manuscript have been confirmed in 48 towns and 15 provinces with populations of approximately 100 community members in several social categories (old and young, rich and poor, women and men). All information was obtained directly by conducting an ethnobotanical survey in the region.

Discussion

Data about the different uses of the 71 taxa were obtained from local people via a survey. Data for about 20 of the 71 taxa are reported for the first time in this article. Data for the other taxa have been reported in different research studies (Baytop 1984; İlçim and Varol 1996; Özçelik et al. 1990; Öztürk and Özçelik 1991; Sezik et al. 1991; Sezik et al. 1997; Tabata et al. 1994; Tonbul and Altan 1989; Yıldırımlı 1985). However, the specific uses of the plants and the plant parts used vary in the different regions. Some of the uses are similar to those in our data. The similar use of these plants in different regions is encouraging to people who rely on these plants for ethnobotanical purposes.

Local people of the East Anatolia region have a long history of traditional uses for plants, which was gained through many difficult and painful experiments. This experience can be seen in the use of plants as food, fodder, spices, traditional medicine, ornamentals, and handicrafts. Although traditional medicine is still widely practiced throughout the region, it is being rapidly replaced by modern medicine and pharmaceuticals. Lately, the fear of losing their cultural heritage has prompted people in the region to produce medicinal plants. This effort is outlined briefly.

Most of the medicinal plants are stored under dry conditions to allow use throughout the year. For this reason, the plant parts being used sometimes change according to the seasons and medical purposes.

The primary use of folk remedies is for skin problems, including wounds, abscesses, eczema, and bleeding. The second most frequent use is to treat gastrointestinal disorders, including stomach ache, ulcers, diarrhea, hemorrhoids, and respiratory ailments (e.g., the common cold, cough, and bronchitis).

For skin problems, either fresh or dried plant parts are applied to the skin directly in the form of an ointment or decoction. The bruised leaves of appropriate plants are applied to the skin and must be changed frequently. Remedies for gastrointestinal disorders are generally taken orally, either by drinking decoctions or by eating fresh or dried parts of the appropriate plants. Survey informants stated that latex obtained from various parts of the plants had several different effects. For this reason, latex was often used to treat medical problems. In the summer, people in the region usually put one or two drops of latex on each lump of sugar and store the treated sugar lumps for use in the winter.

The folk remedies used to treat respiratory tract disorders (e.g., cough, sore throat, bronchitis, tonsillitis, cold, and flu) are generally administered by drinking a decoction, but sometimes they are administered by gargling or bathing. However, for the treatment of sinusitis, a juice (obtained by squeezing the roots of herbs)

TABLE 1. FOLK REMEDIES OF EAST ANATOLIA.

Family/Species	Vernacular name	Locality	Plant part	Use	Method of use	Collection no.
Amaranthaceae						
Amaranthus retroflexus L.	Horoz ibiği	5, 19, 40	LF	For sterility	Inf (int)	F 5289
Anacardiaceae						
Pistacia terebinthus L.	Menengiç	7, 45	FR	For cold and flu; as diuretic	Dec(int)	F 10 100
Apiaceae						
Eryngium billardieri Delar	Tüsü	2, 48	RT	For sinusitis, catarrh	Fresh, pounded, juice (gt; sniffed)	F 6186
		17, 42	HB	For wounds	Powder (ext)	
		34, 39	RT*	For smoking cessation	+ Tobacco (cigarette)	
Ferula haussknechtii Wolff ex Rech. fil.	Heliz	1, 10, 14	RT	As additive for herbal cheese	Fresh	F 5010
Heracleum crenatifolium Boiss.	Sov	3, 16, 34	SH	As vegetable and condiment	Fresh	F 3432
Araceae						
Arum dentrucatum C. A. Mey. ex Schott var. *videscens* (Stapf.) K. Alpinar & Miller	Karibel	6, 9	RT*	For diabetes	Dec (int)	F 2796
Asclepidaceae						
Vincetoxicum canescens (Willd.) Decne. subsp. *canescens*	Zilasur	10, 17, 46	BO	For scabies	Pounded (ext)	F 5675
Asteraceae						
Achillea millefolium L. Subsp. *millefolium*	Civan perçemi	20, 32, 41	FL	As diuretic, urinary antiseptic	Dec (int)	F 5110
A. vermicularis Trin	Civan perçemi	4, 22, 37	HB*	For swelling of stomach (children)	Dec (int)	F 5656
Anthemis nobilis L.	Sarı papatya	12, 27, 28	FL	As diuretic, for stomach ache	Inf (int) Tea	F 2990
Arctium minus Bernh. subsp. *pubens* L.	Top telli	7, 13, 23	FL	For eye diseases	Red parts pounded (gt)	F 8740
A. tomentosum Miller var. *glabrum* (Körnicke) Arenes	Top telli	15, 27, 47	LF	For swelling of stomach	+ Milk, boiled (ext)	F 8730
		9, 21, 47	RT	For absceses	+ Milk, pounded, (ext)	
Bellis perennis L.	Koyun gözü	24, 30, 43	FL	For diarrhea; as diuretic, purgative	Inf (int)	F 5348
Carthamus tinctorius L.	Aspir	8, 26, 29	FL	As a dye in cosmetics and food	Boiled	F 4032

TABLE 1. CONTINUED.

Family/Species	Vernacular name	Locality	Plant part	Use	Method of use	Collection no.
Cichorium intybus L.	Talişk	3, 46, 47	RT	For epilepsy (3 days)	Boiled for long time (int)	F 1501
Gundelia tournefortii L. var *tournefortii*	Kenger	9, 46 48	SD*	For vitiligo	Coffee	F 2888
Helichrysum plicatum DC subsp. *plicatum*	Herdem-taze	All localities	SH	For kidney stones	Inf (int)	F 2757
		All localities	FL	For kidney stones		
Inula helenium L. subsp. *pseudohelenium* Grierson	Andız	3, 35	RT	For relaxing of chest pain	Inf (int)	F 2556
Scorzonera latifolia L.	Kanok	5, 11, 31	RT	For sterility	Gum (ext)	F 6100
Berberidaceae						
Berberis vulgaris L.	Karamuk	15,18,45	RT	For jaundice in animals	(Int; by licking)	F 8337
Leontice leontopetalum L. subsp, ewersmannii (Bunge) Coode	Kırkbaş otu	14, 39, 46	RT*	For epilepsy	Dec (int)	F 2830
Boraginaceae						
Alkanna orientalis (L.) Boiss. var. *orientalis*	Havacıva otu	16, 33, 42	RT	For wounds	+ Better; ointment (ext)	F 5353
Echium italicum L.	Deve dilli	8,19,36	RT	For wounds	+ Butter (ext)	F 3847
Brassicaceae						
Lepidium latifolum L.	Nujdar	16, 23	LF	For wounds	Powder (ext)	F 541
Caryophyllaceae						
Telephium imperati L. subsp. *orientale* (Boiss.) Nyman	Mayasıl otu	2, 9, 10	LF*	For hemorrhoids	Boiled (ext)	F 8561
Crassulaceae						
Umblicus erectus DC		38, 45	RT	For sterility	Whole plant boiled (int)	F 10 094
Cupressaceae						
Juniperus oxycedrus L.	Dikenli ardıç	7, 46	FR	For rheumatism	Dec (ext; bath)	F 10 110
Cyperaceae						
Cyperus rotundus L.	Topalak	2, 40, 48	RT*	As a diuretic	Inf (int)	F 10 107
Equisetaceae						
Equisetum arvense L.	At kuyruğu	All localities	HB	As a diuretic	Inf (int)	F 4255
Euphorbiaceae						
Euphorbia heteradena Jaub. & Spach	Sütleğen	13, 38 41	LX	For constipation	Middle part of plant	F 6168
Fabaceae						
Astragalus sp.	Arap zamkı	1, 10, 44	GM	As fire wood; for producting gum tragacanth	Gum	F 8500
Glycyrrhiza glabra L.	Meyan	6, 22, 24	RT	For cough, bronchitis	Dec (int)	F 9865

TABLE 1. CONTINUED.

Family/Species	Vernacular name	Locality	Plant part	Use	Method of use	Collection no.
Trigonella foenum-graecum L.	Pıltan	7, 11, 23	SD	As hypoglycemic	Pounded or dec (int)	F 2468
Globulariaceae						
Globularia trichosantha Fisch. & Mey.	Ahu	45, 46, 47	LF*	For parasites	Inf (int)	F 5299
Hypericaceae						
Hypericum perforatum L.	Binbir delikotu	11, 17, 37	HB*	For stomach ache	Dec (int)	F 5893
Juglandaceae						
Juglans regia L.	Ceviz	39, 40, 43	LF	For bleeding	Fresh, pounded (ext)	F 8759
		1, 13, 47	FR	As promoter of maturation of abscess	Fresh, poultice (ext)	
		1, 9, 48	BR	For wounds	Pounded (ext)	
		1	CO*	As hypoglycemic	Pounded or dec (int)	
Lamiaceae						
Mentha longifolia (L.) Hudson subsp. *longifolia*	Tüylü nane	16, 28, 39	LF	For cold and flu	Dec (ext; bath)	F 1390
		33, 43, 48		For heart palpitations; catarrh	Dec (int)	
M. pulegium L.	Nane	33, 42	HB + FL	For gall bladder disorders	Dec (int)	F 5888
Origanum majorana L.	Mercanköşk	9, 10, 11	ST*	As sedative or diaphoretic; for stomach ache	Fresh (int; eaten)	F 5684
O. vulgare L. subsp. *gracile* (C. Koch) letswaart	Catır	15, 18, 36	HB	For wounds, stomach ache	Dec (int) Dec (int)	F 3224
Salvia verticillata L. subsp. *verticillata*	Ada çayı	22, 23, 43	LF	For catarrah, common cold	Dec (int)	F 2806
Teucrium chamaedrys L. subsp. *sinuatum* (Celak) Rech. fil.	Derman	10, 14, 42	HB	For stomach ache	Dec (int)	F 1158
T. polium L.	Beyaz ot	3, 34–37, 48	ST	For stomach ache	Fresh (int; eaten)	F 4143
Thymbra spicata L.	Zahter	2, 7, 8	HB	As antiseptic	Dec (int)	F 6327
Liliaceae						
Merendera trigyna (Steven ex Adam) Stapf.	Gül falcı	1, 44	BU*	For rheumatitis	(int; eaten)	F 5702
Malvaceae						
Alceae calvertii (Boiss.) Boiss.	Hıra çiçeği	4–6, 12, 33	RT	For kidney stones	Inf (int)	F 6586

TABLE 1. CONTINUED.

Family/Species	Vernacular name	Locality	Plant part	Use	Method of use	Collection no.
A. setosa Alef.	Hatmi	21-25, 39, 43	LF	As expectorant, diuretic, emollient	Inf (int)	F 4010
A. fasciculiflora Zohary	Hatmi	15, 25, 38	RT	For passing of kidney stones	Dec (int)	F 8880
		2, 10	RT*	For abscesses, itching of scabies	Residue (ext)	F 7565
Althaea officinalis L.	Hatmi	5, 12, 32, 40	HB	As diuretic, antilithic	Inf (int)	F 4498
Malva neglecta Wallr.	Ebegümeci	All localities	LF	As promoter of maturation of abscess	Poultice (ext)	F 3562
Plantaginaceae						
Plantago atrata Hoppe	Sinir otu	All localities	LF	For wounds	Fresh (ext)	F 4060
P. lanceolata L.	Sinir otu	All localities	LF	For wounds	Fresh (ext)	F 8287
P. major L. susp. *major*	Boğa yaprağı	All localities	LF	For wounds	Dried (ext)	F 6256
		All localities	LF	As promoter of maturation of abscess	Fress (ext)	
P. maritima L.	Yılan dili	8, 10, 11	LF*	As wash for cancerous uterus	Dec (int)	F 4640
Poaceae						
Zea mays L.	Mısır	All localities	SI	As antilithic, diuretic; for hemorrhoids	Inf (int)	F 7978
Polygonaceae						
Rheum ribes L.	Işkin/Ribes	9, 11, 46	RT*	For diabetes, ulcer, diarrhea; as anthelmintic	Dec (int)	F 4832
		3, 6, 44	SD	For diarrhea	Dec (int)	
		4, 5, 16, 35	SH	For hemorrhoids	Dec (int)	
		9, 11, 13	SB	For digestion	(Int; eaten)	
		45, 46	LF	For stomach disorders	(Int; eaten)	
Rumex crispus L.	Kuzu kulağı	15, 33, 43	LF	For hemorrhoids; as anti-inflammatory, antiphlogistic, antirheumatic	Pounded (ext)	F 8866
Rosaceae						
Crataegus monogyna Jacq.	Alıç	10, 15, 23, 35	FR	As sedative, antispasmodic	(Int; eaten)	F 5897

TABLE 1. CONTINUED.

Family/Species	Vernacular name	Locality	Plant part	Use	Method of use	Collection no.
Rosa canina L.	Gül/Şilan	5, 12, 20, 41	FR	For hemorrghoids, cough, stomach ache	Stewed (int)	F 6545
Ranunculaceae						
Nigella segetalis Bieb.	Çörekotu	All localities	SD	For diabetes, ulcers	Dec (int)	F 7179
Resedaceae						
Reseda lutea L. var *lutea*	Muhabet çiçeği	12, 13, 39, 30	RT	For stomach pains	(Int; eaten)	F 4486
Rubiaceae						
Galium verum L. subsp. *glabrescens* Ehrend.	Yoğurt otu	32, 36, 39	FL*	For all cancers	Powder (int; eaten)	F 6182
Scrophulariaceae						
Scrophularia libanotica Boiss, var. *urartuensis* R. Mill.	Süpürge otu	2, 5	LF*	For inflamed wounds	(Ext; applied)	F 3563
Solanaceae						
Hyoscyamus niger L.	Ban otu	1, 8, 14, 23	SD	For toothache, tooth cavity	(Inhaled)	F 5879
H. reticulatus L.	Dağdoğan	All localities	RT + SD	For intoxication	(Eaten)	F 4408
Urticaceae						
Urtica dioica L.	Isırgan otu	2, 4, 39, 44	HB*	For all cancers	Fresh (eaten)	F 5157
		All localities	HB	For rheumatic pain	Fresh (eaten)	
U. urens L.	Isırgan otu	4, 16–19, 29	LF	For diarrhea	Tea (int)	F 5040
		All localities	LF	As diuretic	Tea (int)	
Valerianaceae						
Valeriana alliariifolia Adams	Kediotu	2, 20, 28, 44	RT*	As sedative, antispasmodic	Tea (int)	F 8300
Zygophyllaceae						
Peganum harmala L.	Üzerlik	All localities	RT	For hemorrhoids	Dec (int)	F 5056
		3, 11, 30, 45	SD	For prostatitis, urinary incontinence		

Locality: 1. Van, Bahçesaray; 2. Van, Özalp; 3. Van, Erciş, 4. Van, Muradiye, 5. Van, Çaldıran, 6. Van, Başkale; 7. Van, Gevaş; 8. Hakkari, Yüksekova; 9. Hakkari, Çukurca; 10. Hakkari, Şemdinli; 11. Siirt, Pervari; 12. Siirt, Eruh; 13. Siirt, Baykan; 14. Batman, Sason; 15. Bingöl, Solhan; 16. Bingöl, Yayladere; 17. Bingöl, Karlıova; 18. Tunceli, Pertek; 19. Tunceli, Pülümür; 20. Erzurum, Horasan; 21. Erzurum, Tortum; 22. Erzurum, Pasinler; 23. Erzurum, Çat; 24. Erzurum, Tekman; 25. Erzurum, Hınıs; 26. Erzurum, Karayazı; 27. Erzincan, Tercan, 28. Erzincan, Kemah; 29. Elazığ, Palu; 30. Elazığ, Kovancilar; 31. Elaziğ, Karakoçan; 32. Malatya, Darende; 33. Malatya, Pütüge; 34. Ağrı, Doğubeyazıt; 35. Ağrı, Tutak, 36. Ağrı, Diyadin; 37. Ağrı, Hamur; 38. Kars, Sarıkamış; 39. Kars, Digor; 40. Kars, Akyaka; 41. Muş, Malazgirt; 42. Muş, Bulanik, 43. Muş, Varto; 44. Bitlis, Hizan; 45. Bitlis, Mutki; 46. Bitlis, Tatvan; 47. Bitlis, Adilcevaz; 48. Bitlis, Ahlat.

Abbreviations: bo: bud, br: bark, bu: bulb, co: cortex, dec: decoction, ext: externally f: collected by fevzi özgökçe, fl: flower, fr: fruit, gm: gum, gt: drops, hb: herb, inf: infusion, int: internally, lf: leaf, lx:latex, rt: root, sb: young shoot bark, sd: shoot, sl: stylus, sp: stipe, st: stem, tb: tuber, wp: whole plant: *first time reported, +: mix with.

or an infusion of the herbs is dropped into the nostrils.

Several plant species are used as topical remedies for rheumatic diseases. Bathing was the choice of application, but some plants were applied as a vesicant. The treatment period for vesicants is very important, because a long application period could cause several skin irritations.

Many of the plants are taken orally as a diuretic in the form of a decoction to remove kidney stones.

An interesting remedy is the use of *Leontice leontopetalum* roots in the treatment of epilepsy. A decoction prepared by boiling the pounded roots for 5 hours is taken on an empty stomach in the morning for 3 days.

Direct application of plant material, either fresh or dried, was the most popular method of application. Fresh materials are usually taken orally or applied externally after being pounded. Sometimes the material is cooked with a little water to prepare a poultice or applied after being roasted on a fire. In some cases, however, liquid plant products (e.g., a juice obtained by squeezing plant parts (usually leaves or roots), latex obtained by cutting the stem, and resins obtained by injuring the stem) are used directly without any additives. Dried material, generally powdered or sometimes moistened, is taken orally or applied externally. Some palatable additives (e.g., honey) are preferably mixed with powdered material for oral administration.

The second most common practice is the application of liquid preparations, mainly decoctions or infusions. Decoctions are prepared by boiling the powdered or crushed plant material with water for a few minutes. Filtration or straining, using a piece of cloth, is generally recommended to remove the residue.

Seven percent of the preparations are used as an ointment for skin treatments. Mixing the powdered or crushed plant with one or more suitable additives (e.g., butter, filtered yogurt, alum, petroleum jelly, honey, flour plus soap, or sulphur powder) is recommended for the preparation of ointments.

Taking a medicated bath is also practiced, especially for the treatment of rheumatism and a cold. A bath is prepared by adding a plant part to hot water, or a warm decoction is prepared.

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Traditional Medicine in Turkey VII. Folk Medicine in Middle and West Black Sea Regions

Author(s): Tetsuro Fujita, Ekrem Sezik, Mamoru Tabata, Erdem Yeşilada, Gisho Honda, Yoshio Takeda, Toshihiro Tanaka and Yoshihisa Takaishi

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Traditional Medicine in Turkey VII. Folk Medicine in Middle and West Black Sea Regions[1]

Tetsuro Fujita, Ekrem Sezik,[2] Mamoru Tabata, Erdem Yeşilada, Gisho Honda, Yoshio Takeda, Toshihiro Tanaka, and Yoshihisa Takaishi

Sezik, Ekrem, Yeşilada, Erdem *(Gazi University, Faculty of Pharmacy, Ankara 06330, Turkey),* **Fujita, Tetsuro, Tabata, Mamoru, Honda, Gisho** *(Kyoto University, Faculty of Pharmaceutical Sciences, Kyoto 606),* **Tanaka, Toshihiro** *(Gifu Pharmaceutical University, Gifu),* **Takeda, Yoshio** *(Tokushima University, Faculty of Integrated Arts and Sciences), and* **Takaishi, Yoshihisa** *(Tokushima University, Faculty of Pharmaceutical Sciences, Tokushima, Japan).* Traditional Medicine in Turkey VII. Folk Medicine in Middle and West Black Sea Regions. *Economic Botany 49(4):406–422, 1995. Traditional medicine in the middle and west Black Sea regions: Amasya, Bilecik, Bolu, Çankırı, Samsun, Sinop and Tokat provinces has been studied and 194 remedies obtained from 96 plant and 5 animal species are compiled. Vernacular names, parts used, methods of preparation, and medicinal usages are listed.*

Türkiye'de Geleneksel Tababet VII. Orta ve Bati Karadeniz Bölgelerinde Halk Ilaçları. *Orta ve Batı Karadeniz Bölgelerinde Amasya, Bilecik, Bolu, Çankırı, Samsun, Sinop ve Tokat illerinde halk tababeti incelenerek, 96'si bitkisel ve 5'i hayvansal olmak üzere 194 halk ilaci tespit edilmiştir. Kullanılan materyalin mahalli ismi, tedavide kullanilan kısımlari, ilacın hazirlanış şekli ve tedavideki kullanılış amacı ile ilgili bilgiler liste halinde verilmiştir.*

Key Words: traditional medicine; Turkey; Black Sea region; north Anatolia.

The northern part of Anatolia by the Black Sea is called Black Sea subdivision or North Anatolia. Since this subdivision comprises lengthwise areas showing differences in topographic features, climate, ethnic origin, socio-economical welfare, etc., it seems reasonable to divide it into east, middle, and west Black Sea regions. High and continuous mountain ranges, which are parallel to the coastal line in the eastern part of Black Sea region (highest peak 3932 m, Kaçkar Mountain), spread out from Ordu to the west, where the highest peaks are set back from the coast and the mean altitude declines. Several rivers (Kızılırmak, Yeşilırmak) run into the Black Sea from the plateau, facilitating the infiltration of coastal climate into the interior parts. In parallel with the topographic change, the climate also shows variation and the heavy average annual rainfalls prevalent in the eastern parts, 2000 mm, which lessen in the west of Ordu, 500 mm, (except in the far western part of the subdivision, average precipitation 1000 mm).

We have already reported that the East Black Sea region is poor in folk medicine in spite of the rich flora, partly because of the economically important tea and hazelnut cultivation (Sezik et al. 1991). On the other hand, the agricultural as well as industrial development has not been fully realized in the middle and west regions of the Black Sea subdivision, so that the socio-economical situation is greatly different from that of the east region.

Little has been documented on the folk medicine of the west and the middle regions of the Black Sea subdivision, except for the use of folk medicine in the coastal provinces, Kastamonu (Sezik, Zor, and Yeşilada 1992) and the ethno-

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[2] Correspondance to: E. Sezik, Gazi Üniversitesi, Eczacilik Fakültesi, Hipodrom 06330, Ankara, Turkey.

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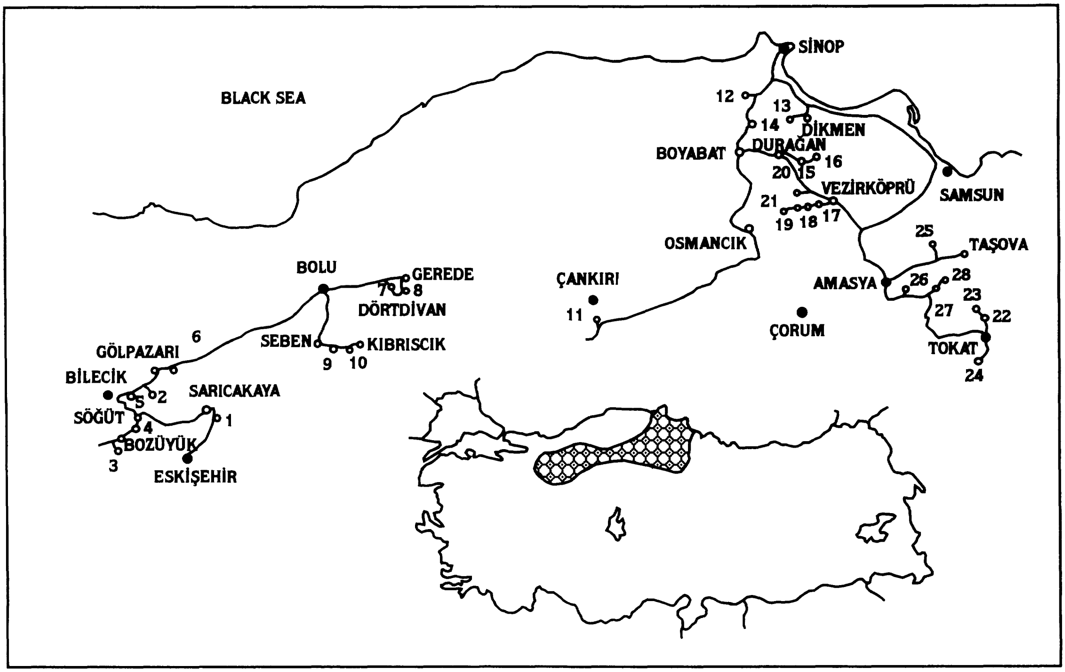

Fig. 1. Route of survey in the region and collection sites of the information. Numbers referring to the collection sites of the information are as follows; 1. ESKİŞEHİR, Saricakaya, Dağküplü, 2. BİLECİK, Söğüt, Harmankaya, 3. BİLECİK, Bozüyük, Göynücek, 4. BİLECİK, Söğüt, Kepen, 5. BİLECİK, Merkez, Deresakarya, 6. BİLECİK, Gölpazarı, Doğancilar, 7. BOLU, Dörtdivan, Yukari Sayik, 8. BOLU, Gerede, Yeşilvadi, 9. BOLU, Seben, Çeltikdere, 10. BOLU, Kibriscik, Alanhimmetler, 11. ÇANKIRI, Merkez, Aşaği Pelitözü, 12. SİNOP, Merkez, Sazli, 13. SİNOP, Dikmen, Babalioğlu, 14. SİNOP, Boyabat, Akçakese, 15. SİNOP, Durağan, Sariyar, 16. SİNOP, Durağan, Beyardiç, 17. SAMSUN, Vezirköprü, Karaköy, 18. SAMSUN, Vezirköprü, Sofular, 19. SAMSUN, Vezirköprü, Yukari Narli, 20. SAMSUN, Vezirköprü, Dariçayalani, 21. ÇORUM, Osmancik, Zeytin, 22. TOKAT, Merkez, Sirçali, 23. TOKAT, Merkez, Çerdiğin, 24. TOKAT, Merkez, Tahtaoba, 25. AMASYA, Taşova, Destek, 26. AMASYA, Merkez, Kale, 27. AMASYA, Merkez, Beldağ, 28. AMASYA, Merkez, Yuvaköy.

botanical utilization of plants in Akdağ mountain in Amasya province (Alpinar 1979).

In the present report, in addition to plant drugs used in the middle (Samsun, Sinop, Amasya, Tokat, Çorum, Çankırı) and the west (Bolu) Black Sea regions, those in Eskişehir (Central Anatolia subdivision), and Bilecik (Marmara subdivision) are also described in consideration of their geographical features (the areas studied are geographically included in west Black Sea subdivision).

Methodology

Detailed methodology for the field survey of folk medicine has been described elsewhere (Sezik et al. 1991). Briefly, information was collected by interviewing with rural people in selected places. Field studies were performed in 28 villages which were selected from among different parts of the subdivision (Fig. 1). Informants were then asked to guide us to the places where these plants grew or to bring the drug they use. In order to eliminate information of secondary sources, informants were also asked for the source of their knowledge. When a group of informants gave different answers to the medicinal use or the local name of a plant, they were asked to discuss the matter thoroughly among themselves to decide which statement was reliable. Further efforts were made to double-check any information provided by asking the opinion of older people in neighboring villages. Voucher specimens were prepared and numbered in dublicates and stored in the Herbarium of Faculty of Pharmacy, Gazi University, and the Herbarium of Medicinal Plant Garden, Kyoto University. Taxonomic determinations were performed by Sezik, Yeşilada and Honda (co-authors).

TABLE 1. FOLK MEDICINE IN MIDDLE AND WEST BLACK SEA REGIONS; SINOP, SAMSUN, TOKAT, AMASYA, ÇANKIRI, BOLU, BILECIK, ESKIŞEHIR PROVINCES.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
Fungi				
Langermannia sp.	püslek	3	WP	As desiccant for wounds; ext, applied on wound after powdered [*91A196*]
	hoskulak	21	WP	As desiccant for wounds; ext, as described above [*93C018*]
	tozkulak	19	WP	As desiccant for burns; ext, as described above [*93C023*]
	porsuk	4	WP	To stop bleeding; ext, as described above [*91A194*]
Anacardiaceae				
Rhus coriaria L.	tetire	5	LF	For gastric ulcer, stomachache; int, dec [*91A142*]
Aspidiaceae				
Polysticum aculeatum (L.) Roth.	eğraltı	12, 13	HB	Against abdominal pain; ext, applied on abdomen [*91D047*]
Berberidaceae				
Berberis crataegina DC.	kızamık dikeni	14	RT	Against anal fistula; int, boiled, cooled for overnight, taken 3 times a day [*91D024*]
	karamuk	24	RT	As anthelmintic for cattle; int, boiled [*91D181*]
Betulaceae				
Coryllus avelana L.	yabani findık	15, 16	LF	For sunstroke; ext, as bed, naked body of the patient is covered with fresh leaves [*93C021*]
Boraginaceae				
Echium italicum L.	kesikotu	19	RB	For wound healing; ext, root barks are peeled off and roasted in a pan with butter to prepare an ointment [*93C008*]
	havacıva	23	RT	For wound healing; ext, roots are washed and grated into a pan and roasted with butter, then squeezed through muslin to obtain an ointment [*91D136*]
Caprifoliaceae				
Sambucus ebulus L.	sultanotu	3	LF, RT	Against rheumatic pain; ext, fresh leaves are heated over a fire and applied on the body where it pains. In winter, dried leaves can be used after moistened, but usually roots are preferred in winter for the same purpose after being pounded, but fresh leaves are said to be more effective [*90D042*]
	yüyün = yetün	13	LF	Against rheumatic pain; ext, fresh leaves are heated over a fire and applied to site of pain [*93C014*]

TABLE 1. CONTINUED.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
	yiğdin	23	LF	Against rheumatic pain; ext, leaves are boiled together in a large boiler with tar of pine tree "çam pürü", tar of *Juniperus* sp. tree "ardiç pürü", and rheumatic pains are treated by bathing the patient in this extract [*91D129*]
	yidinotu = ivdinotu	25	LF	Against rheumatic pain; ext, as described above for locality 23 [*91D184*]
	yavaşana = iyidün	12	LF	Against rheumatic pain and bruises; ext, pounded with salt and garlic and applied on body [*93C012*]
	iğdenotu	14	LF	Against rheumatic pain and bruises; ext, pounded
				For abscesses (for cattle); ext, roasted with butter and applied on abscess [*91D019*]
	yiyden	17	LF	For hemorrhoids; int, dec [*93C015*]
Sambucus nigra L.	patlanguç = özübüyük	24	LF	For prostatitis; int, dec, on empty stomach [*91D149*]
Viburnum opulus L.	gilaburu	22	FR	As hypoglycaemic, to ease cough, to pass kidney stone; int, dec [*91D190*]
Compositae				
Achillea setacea Waldst. & Kit	ayvadana	3	FL + HB	For stomachache; int, dec, tea [*90D049*]
Anthemis austriaca Jacq.	akbaşotu	5	FL	For abdominal pain; int, dec, tea [*91A141*]
A. cotula L.	koyungözü	24	FL	Against pneumonia, pain in the chest; ext, flowers are cooked together with herbs of *Teucrium chamaedrys* and *T. polium,* leaf and flowers of *Althea setosa,* herbs of *Urtica dioica,* herbs of *Malva nicaensis* to prepare a poultice and applied ext for 24 hours [*91D153*]
	papatya	26	HB	Against stomachache, sore throat, bronchitis; int, dec [*91D087*]
A. tinctoria L.	papatya	26	HB	Against stomachache, sore throat, bronchitis; int, dec [*91D141*]
Arctium minus (L.) Bernh. ssp. *minus*	kocaot = kokarot	9	LF	For rheumatic pain, against fever, sunstroke; ext, fresh leaf is treated with salt and applied on joints or a poultice prepared by boiling the leaves in water is used to alleviate rheumatic pain. In case of high fever, due to an infection of sunstroke, naked body of the patient, often a child, is covered with fresh broad leaves to lower the fever [*91A175*]
	kabalak	14, 15	LF	For sunstroke; ext, garlic is pounded with filtered yoghurt and applied on naked body, then covered with the fresh broad leaves of the plant for 5–6 hours [*91D023*]

TABLE 1. CONTINUED.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
	büyükkabalak	20	LF	For sunstroke; ext, as described above [*93C013*]
	acıkabalak	17	LF	Against inflammation; ext, a fresh leaf is directly applied on inflammated part [*93C007*]
Centaurea solstitialis L. ssp. *solstitialis*	çakırdikeni	11	SD	Against herpes infections around lips (for children); ext, roasted and applied after powdering [*93B001*]
Helichrysum plicatum DC.	sarılık çiçeği	4	FL	Against jaundice; int, dec [*91A182*]
	yayla çiçeği	27, 28	FL	To pass kidney stone; int, inf [*91D097*]
		27	HB	For wound healing; ext, burned, ash is applied on wounds
H. plicatum DC. ssp. *plicatum*	yayla çiçeği	22	FL	For piles on hand and foot; int, dec, cooled for overnight [*91D108*]
Onopordum turcicum Danin.	kangaldikeni	24	HB	For hemorrhoids; int, dec, tea [*91D150*]
			SD	For hemorrhoids; int, swallowed
Silybum marianum (L.) Gaertner.	kocakavkas = başkavkas	5	SD	For shortness of breath in bronchitis; int, roasted, ground, boiled in water [*91A143*]
Cornaceae				
Cornus mas L.	kızılcık	13	FR	Against diarrhea; int, boiled, cond. to a paste form [*93C024*]
	kirencik ekşisi*	17	FR	For sunstroke; ext, boiled fruits are put inside a cotton sack and squeezed to obtain a pulp and then condensed. This pulp is smeared on the body of the patient and then covered with the herbs of "sunanesi" (*Mentha* sp.) [*93C016*]
	zoğal = kiren	26	SD	For intestinal pain; int, roasted, milled, boiled with water [*91D182*]
Crassulaceae				
Sempervivum armenum Boiss. & Huet. var. *armenum*	temreotu	13	LF	To remove warts; ext, fresh plant is pounded to obtain juice [*91D058*]
Cruciferae				
Brassica oleracea L. var. *capitata* L.	kelem	7	LF	To reduce inflammation in rheumatis; ext, mixed with barley flour, boiled and applied on legs [*91A183*]
		22, 26	LF	For maturation of abscess; ext, fresh leaves are applied after heated on fire [*91D185*]
		23	LF	For maturation of abscess; ext, fresh leaves are cooked and mixed with butter and applied on abscess [*91D191*]
		24	LF	Against abdominal pain; ext, mixed with olive oil and applied on abdomen [*91D187*]
	keremotu	25	LF	For maturation of abscess; ext, heated on fire [*91D180*]

TABLE 1. CONTINUED.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
Cucurbitaceae				
Bryonia alba L.	ülüngül = ilengül	26	RT	For hemorrhoids; int, dec [*91D087*]
Ecbalium elaterium A. Rich.	acıdüvlek	5	FR	Against jaundice; juice is directly applied into nostrils [*91A148*]
	çıtlanbuk = yabani kavun	26	FR	Against jaundice; juice is directly applied into nostrils [*91D085*]
Cupressaceae				
Juniperus communis L. ssp. *nana*	ardıç, ardıç gugucu*	22	FR	For cough, pain, hemorrhoids; int, swallowed as pills [*91D119*]
	ardıç katranı*	22	TR	Against scabies, heat rash; ext, applied to body for 2 days
J. exelsa Bieb.	karaardıç = dikenardıcı	26	FR	For common cold and bronchitis; int, boiled, cooled [*91D088*]
J. oxycedrus L.	ardıç giligilisi*	4	FR	For common colds; int, dec [*91A191*]
	dikenli ardıç evi*	12	FR	For hemorrhoids; int, swallowed like pills [*93C022*]
				For dysurea; int, dec, every morning before breakfast
	ardıç katranı*	5	TR	For maturation of abscess, wound healing; ext, a concoction of tar with onion juice, egg yolk and soap, is roasted in a pan and then applied on abscess for maturation, or tar is directly applied on wounds for rapid healing [*91A187*]
		8	TR	Against colds (for animals); int, swallowed [*91A195*]
	sarıardıç, sarıardıçevi*	14	FR	For bronchitis, cough; int, swallowed as pill or dec [*91D025*]
	karakatran*	15	TR	To ease cough; int, mixed with honey [*93C025*]
	tikenardıcı	27	FR	For anal fistula; int, mixed with honeywax, swallowed [*91D094*]
Elaeagnaceae				
Elaeagnus angustifolia L.	iğde	10	RB	For dysurea; int, dec, tea [*91A185*]
Euphorbiaceae				
Euphorbia stricta L.	sütleğen	14	LX	To clean the spring water; One drop is put inside water [*91D021*]
E. amygdaloides L. var. *amygdaloides*	sütleğen	14	LX	To clean the spring water; One drop is put inside water [*91D022*]
Gramineae				
Hordeum vulgare L.	arpa	4	FR	For common colds; int, dec [*91A192*]
Zea mays L.	mısır	27	SD	For hemorrhoids; int, red seeds, eaten [*91D183*]
	mısır püskülü	27	ST	To pass kidney stone; int, dec, cooled

TABLE 1. CONTINUED.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
Juglandaceae				
Juglans regia L.	ceviz	2	FR[1]	Against malaria; int, dec [*91A200*]
		8	FR[1]	Against rheumatic pain; ext, pounded [*91A188*]
		9	LF	Against fever; ext, leaves are spread to form a bed for unclothed patient who is covered with fresh leaves [*91A193*]
		10	LF	Against rheumatic pain; ext, pounded [*91A189*]
		22	LF	For rheumatic pain; ext, mixed with raw salt, boiled and used as bath [*91D196*]
		12, 15 16, 17	LF	For sunstroke; ext, naked body of a patient is covered with the fresh leaves [*93C028, 93C030*]
Labiatae				
Mentha longifolia L.	eşeknanesi	9	HB	Against stomachache; int, dec, tea [*91A174*]
Mentha sp.	sunanesi	17	HB	For sunstroke; ext, patient's skin is smeared with the pulp of *Cornus mas* and covered with the fresh mint [*93C006*]
Salvia aethiopsis L.	kızıllık	7	RT	For wound healing; ext, grated roots are boiled together with the resin of *Abies bornmülleriana,* butter and beeswax, mixture is then condensed into an ointment form. It is applied every day on cuts and other wounds for 5 to 10 days [*91A161*]
Salvia tomentosa Miller	şabla	4	HB	Against rheumatic pain; ext, dec, bath, two pieces of herbs are boiled with two pieces of roots of *Helleborus orientalis* "kiçkiranotu" and this extract is used as a bath for both men and animals [*91A134*]
Teucrium chamaedrys L.	mayasılotu	7	HB	For hemorrhoids; int, dec [*91A164*]
		23	HB	For swellings on hand or body; int, dec, cooled [*91D130*]
	kısacıkmahmut	24	HB	Against pneumonia, pain in the chest; ext, herbs of *Teucrium chamaedrys* and *T. polium,* leaf and flowers of *Althea setosa,* herbs of *Urtica dioica,* flowers of *Anthemis cotula,* herbs of *Malva nicaensis* cooked together to prepare a poultice and applied ext for 24 hours [*91D155*]
T. polium L.	kısamahmut	4	HB	For common colds, bronchitis; int, dec [*91A194*]
	koyunotu	24	HB	For abdominal pain, to stop vomiting; int, fresh herbs are chewed or dec is taken [*91D145*]
				Against pneumonia, pain the chest; ext, as described above for *T. chamaedrys*

TABLE 1. CONTINUED.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
Thymus longicaulis C. Presl. ssp. *longicaulis* var. *subisophyllus*	keklikotu	3	HB	For stomachache; int, dec, tea, on empty stomach [*90D048*]
T. transcaucasicus Ronniger	kekik	7	HB	For common colds; int, dec, tea [*91A162*]
T. zygioides Griseb. var. *lycaonicus*	kekik	4	HB	For stomachache; int, inf, tea [*91A138*]
Leguminosae				
Glycyrrhiza glabra L.	buyan	11	RT	For stomachache, cough; int, dec [*93B002*]
Vicia ervilea (L.) Willd.	burçak	1	SD	To ease cough, bronchitis; int, dec [*90D050*]
V. faba L.	karafasulye	13	LF	For maturation of abscess; ext, fresh leaf is applied after heated on fire [*91D195*]
Liliaceae				
Allium cepa L.	soğan	12	BU	For maturation of abscess; ext, grated [*93C031*]
		13	BU	For maturation of abscess; ext, grated bulbs are heated in a pan for a short time and mixed with grated soap, and then applied on abscess [*93C033*]
A. porrum L.	pırasa	10	BU	As hypoglycaemic; int, 2 kg of bulbs are boiled in water and 1 to 2 glasses of extract is drunk before meals [*93C034*]
A. sativum L.	sarımsak	9	BU	Against rheumatic pain; int, pounded with salt, applied on legs, joints [*93C029*]
		12	BU	Against worms; int, pounded with milk [*93C032*]
Smilax sp.	hüzmek yaprağı	19	LF	For wound healing; ext [*93C009*]
Linaceae				
Linum usitatissimum L.	sağrek	23	SD	For maturation of abscess; ext, pounded and boiled in milk [*91D128*]
Loranthaceae				
Arceuthobium oxycedri (D.C.) Bieb.	parda burcu	6	HB	As panacea; int, dec, tea [*91A181*]
	çakırga burcu	9, 10	HB	For abdominal pain, bronchitis; int, dec, tea [*91A177*]
Viscum album L. ssp. *album*	kuşburnu gökçesi	22	HB	For hemorrhoids; int, dec, cooled [*91D194*]
	kuşburnu kökçesi	23	HB	For hemorrhoids; int, dec
Malvaceae				
Alcea setosa (Boiss.) Alef.	devegülü	24	FL + LF	Against pneumonia, chest pain; ext, flowers and leaves are cooked together with herbs of *Teucrium chamaedrys* and *T. polium*, herbs of *Urtica dioica*, flowers of *An-*

TABLE 1. CONTINUED.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
				themis cotula, herbs of *M. nicaensis* cooked together to prepare a poultice and applied ext for 24 hours [*91D148*]
Malva neglecta Wallr.	ebegümeci	3	LF	For maturation of abscess on neck; ext, boiled in milk, poultice is applied [*90D047*]
		14	LF	For abdominal pain; ext, poultice, on abdomen [*91D022*]
M. nicaeenais All.	ebegümeci	24	HB	For abdominal pain; ext, boiled, mixed with barley flour to obtain a poultice [*91D147*]
				Against pneumonia, chest pain; ext, as described for *Alcea setosa*
Moraceae				
Ficus carica L.	yemiş	1, 2	LX	For scorpion bite, to relieve pain; ext, on bite [*90D051*]
Morus nigra L.	dut pekmezi*	1	FR	Against stomachache; int, one teaglass of condensed fruit juice is drunk every morning on an empty stomach [*90D055*]
	karadut	26	BK	To cure baldness; ext, the ash of burned stem barks is mixed with unsalted butter, and the ointment thus obtained is applied on bald area [*91D197*]
			FR	To treat herpes infection in mouth; int, one teaspoonful of condensed fruit juice is taken or fruit juice is used as gargle [*91D186*]
Oleaceae				
Olea europea L.	zeytin	8	FR	To remove an object from the skin; ext, pounded [*93C037*]
Papaveraceae				
Chelidonium majus L.	—	13	SS	Against pains; ext, applied directly [*91D060*]
Pinaceae				
Abies bommülleriana Mattf.	künar sakızı	7	RE	Against stomachache, indigestion; int, swallowed [*91A184*]
				For wound healing; ext, resin is boiled together with grated root of *Salvia aethiopsis,* butter and beeswax and the mixture is then condensed into an ointment form. It is applied every day on cuts and other wounds for 5 to 10 days
		8	RE	For wound healing; ext, powdered [*91A197*]
		9	RE	For maturation of abscess; ext, the resin, butter, and soap are filled in a hole which is opened in the middle part of

TABLE 1. CONTINUED.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
				an onion and then cooked on embers until butter melts. The finger with abscess is inserted in the hole and kept there for 3 to 5 hours for maturation [*91A201*]
		15	RE	For wound healing, as antiseptic for wounds; ext [*93C036*]
	künar kozalaıkgı*	7	FR	For common colds; int, fresh, dec [*91A185*]
	künar yalamığı*	7	IB	Against stomachache, as panacea; int, eaten
Pinus nigra Arn. ssp. *pallasiana*	çam sakızı*	1	RE	For maturation of abscess, to remove an insect sting from body; ext [*90D056*]
		10	RE	For maturation of abscess; ext, pounded with salt [*91A205*]
		7	RE	Against stomachache, indigestion; int, swallowed [*91A186*]
	karaçam sakızı*	13	RE	For cough, bronchitis; int, sieved and mixed with honey, one spoonful is taken every morning before breakfast
	çam yalamığı*	7	IB	Against stomachache, as panacea; int, eaten
	çam soymuğu*	12	IB	To pass worms, as panacea, for liver diseases; int, eaten [*91D188*]
		14	IB	As panacea, for tuberculosis, bronchitis; int, eaten [*91D192*]
	çam filizi*	8	YS	Against rheumatism; int, dec [*91A202*]
	çam kozalağı*	8	FR	Against hemorrhoids; int, dec
		25	FR	Against worms, anthelmintic; int, dec [*91D200*]
	çam katranı*	10	TR	For maturation of abscess; ext, mixed with salt
	karaçam	13	RT	Against bronchitis and cough; int, after peeling off the bark, cut into small pieces and cooked, cooled overnight and drunk as tea
P. sylvestris L.	çam, çam pisesi*	23, 27	RE	For wound healing; ext, ointment prepared by mixing with beeswax and butter [*91D193, 91D096*]
	çam, çam sakızı*	22	RE	For common colds, as an expectorant, anthelmintic; int, boiled in milk, cooled overnight and taken on empty stomach [*91D189*]
	taze çam gugucu*	22	FR	For common colds, as expectorant, as anthelmintic; int, eaten while fresh
	çam pürü*	27	TR	For rheumatic pain; ext, tar is mixed with that of *Juniperus* sp. "ardiç pürü" and leaves of *Sambucus ebulus* and boiled together in a large boiler, rheumatic pains are treated by bathing the patient in this extract

TABLE 1. CONTINUED.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
	çam	23	YS	For tuberculosis; int, 2 kg of young shoots are boiled in 2 L of water and cooled overnight. One glass of extract is taken orally every day
Plantaginaceae				
Plantago lanceolata L.	sinirotu	3	LF	For maturation of abscess, against pimple; ext, fresh leaf is heated on fire [*90D043*]
P. major L ssp. *intermedia*	hava yaprağı	23	LF	For maturation of abscess; ext, fresh, heated on fire, smear butter and apply [*91D127*]
	siyilotu = bağa yaprağı	24	LF	For maturation of abscess; ext, fresh [*91D146*]
	bağotu	26	LF	For maturation of abscess; ext, fresh [*91D083*], and for gastric ulcer, stomachic disorders; int, dried, mixed with honey and taken 2–3 teaspoonful daily
	duvarula	27	LF	For maturation of abscess; ext, fresh [*91D092*] For gastric ulcer; int, dried, +honey
P. major L. ssp. *major*	siyilotu	7	LF	For maturation of abscess; ext, fresh [*91A198*]
	sinirli kabalak	17, 18, 20	LF	For maturation of abscess; ext, fresh [*93C010*]
	siyilyaprağı	13, 14	LF	For maturation of abscess; ext, fresh, pounded [*91D061*]
	bey yaprağı	22	LF	For maturation of abscess; ext, fresh, + grated soap [*91D110*]
	sinirlibey yaprağı	21	LF	For cuts; ext, fresh [*93C035*]
Plumbaginaceae				
Plumbago europea L.	mayasılotu	2	RT, LF	For eczema on hand, to stop itching; int, dec [*90D021*]
Polygonaceae				
Rheum sp.	çükündür mancarı	13	LF	For maturation of abscess; ext, fresh, heated [*91D056*]
Rumex pulcher L.	aküfelik	25	SD	For hemorrhoids; int, boiled [*91D068*]
	efelik	26	SD	For bronchitis; int, boiled, cooled, on empty stomach [*91D084*]
Punicaceae				
Punica granatum L.	nar	7	FR	For hemorrhoids; int, buy from bazaar, peripcarp of the fruit is dried and powdered and mixed with honey to prepare pills. Three to six of these pills are taken internally to stop bleeding in hemorrhoids. It is nontoxic and can be used for a long period [*91A204*]
Ranunculaceae				
Anemone narcissiflora L.	mayısçiçeği	7	HB	To reduce inflammation in rheumatism; ext, fresh herbs are pounded and applied on legs [*91A169*]

TABLE 1. CONTINUED.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
Helleborus orientalis Lam.	kıçkıranotu = yelotu	4	RT	Against edema in legs (for cattle), toothache; ext, a small piece of root which is sharpened like a nail is inserted into a hole punched in the ear of cattle to reduce inflammation in rheumatism, or a small piece of root is inserted inside a cavity to treat toothache [*91A135*]
	boscuotu	6	RT	For edema in legs (for cattle); ext, two pieces of roots are boiled with two pieces of *Salvia tomentosa* herbs and used as bath for both men and animals or powdered roots may be used internally for the same purpose [*91A206*]
	bohçaotu	8	RT	For edema in legs; ext, as described above for locality 6 [*91A210*]
Ranunculus arvensis L.	sarıpıtrak	4	FL	To drain the edema in eczema; ext, pounded [*91A136*]
R. muricatus L.	yakıotu	3	HB	Against rheumatic pain; ext, pounded and applied on joints for less than an hour [*90D046*]
R. repens L.	mayısotu	22	HB	Against rheumatic pain; ext, fresh plant is pounded and applied on joints for about 30 min [*91D112*]
	tiktikdana	25	FL	To drain a yellow flux in rheumatic pain; ext, dried herbs are applied on joints for 1 day [*91D080*]
Rosaceae				
Cydonia oblonga Miller	ayva	2, 3 10, 13	LF	For common colds, cough, bronchitis; int, dec, tea [*91A211, 91A212, 93C034*]
Malus communis Poir.	elma	27	FR	For dyspepsia, to reduce libido; int, eaten [*91D198*]
Potentilla reptans L.	yılancıkotu	14	HB	Against edema, rheumatic pain, erysipelas; ext; fresh plant is pounded [*91D041*]
Prunus avivum L.	kirazçöpü	26	SK	As diuretic; int, dec [*91D201*]
P. mahlep L.	mehlep	23	LF	For high fever; ext, a mixture of garlic and salt in goat milk or yoghurt is applied to the body of a patient who lies naked on a bed covered with the leaves under sunshine for perspiration [*91D200*]
P. persica (L.) Batsch.	tiltamsak	2	LF	To stop bleeding; ext, pounded [*91A207*]
Pyrus eleagnifolia Pallas ssp. *elaeagnifolia*	çördük	23	FR	For diarrhea; int, dried, eaten [*91D202*]
P. malus L.	acuk, acuk pekmezi	25	FR	For sunstroke, as tonic; int, boiled [*91D069*]
	acuk = elma azması	26	FR	As hypoglycaemic; int, boiled, concd [*91D199*]
Rosa canina L.	köpek dikeni	4	FR, RT	Against hemorrhoids; dec is used ext as well as int [*91A199*]

TABLE 1. CONTINUED.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
	kuşburnu	22	RT	For anal hemorrhoids; int, dec, cooled [*91D115*]
		23	BR	Against itching on the leg, or arm; ext, tip of a branch, burned and oily excrete is dropped into a cup. It is applied on skin against a skin disease called "dermo", which causes itching on extremities [*91D203*]
Rubus hirtus Waldst & Kit.	dağdeveği	22	RT	As hypoglycaemic, for dysurea, and urethal stone; int, dec, tea [*91D118*]
R. sanctus L.	böğürtlen	23	RT, BR	As hypoglycaemic; int, dec, tea [*91D154*]
Salicaceae				
Populus usbekistanica Kom. ssp. *usbekistanica*	servi kavağı	10	BK	Against toothache; ext, a small piece which is cut from the interior part of fresh stem bark is put inside the tooth caviety [*91A210*]
Scrophulariaceae				
Veronica anagallis-aquatica L.	karaot	7	HB	For abdominal pain and rheumatic pain; ext, fresh young herbs are said to be most effective. Herbs are boiled in milk to obtain a poultice which is applied to abdomen for abdominal pain or aqueous extract is used as bath to alleviate rheumatic pain [*91A167*]
Solanaceae				
Datura metel L.	tatala	3	SD	Against hemorrhoids; int, dec [*90D206*]
Hyoscyamus niger L.	dişağrısıotu	3	SD	For toothache; ext, seeds are spread on boiling water and fumes are inhaled through the mouth to treat toothache caused by a worm [*90D044*]
	dişotu	24	SD	To expel worms from mouth which cause pain; ext, same way as described above for locality 3 [*91D152*]
	batbit	26	SD	For worms in toothcavities or eyes; ext, same way as described above for locality 3 [*91D086*]
	—	7	SD	For pain in eyes; ext, seed, spread on dying embers and eyes are exposed to the smoke, to dislodge drop worms, which have a white body and a black head from the patient's eyes suffering from a terrible pain. They do not remember the vernacular name of the plant [*91A168*]
	—	8	SD	For pain in eyes; ext, seed, boiled in water and eye is exposed to the vapour under a blanket to remove the worms causing a severe pain in eyes [*91A170*]
	gözotu	12	SD	For eye itching, eye pain; int, seeds are spread on dying embers and covered with a blanket. Eyes of the patient

TABLE 1. CONTINUED.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
				are exposed to the vapor under the blanket, patient also strikes his head to help dislodge the worms [*91D146*]
	kumacıkotu	23	SD	To pass worms from eyes; ext, seeds are pounded with the tail fat of sheep and put on dying ember and eyes exposed to vapours under a blanket
Lycopersicon esculentum L.	domates	13	FR	For maturation of abscess; ext, cut in halves, spread with some sugar and applied on abscess
Thymelaceaea				
Daphne oleoides Schreber.	çoban süpürgesi	6	RT	For malaria; int, pounded with sugar [*91A151*]
Tiliaceae				
Tilia rubra DC.	ıhlamur	12, 25	FL	For common colds, catarrh; int, inf, tea [*93C037*]
		14	FL	For cough; int, inf, tea [*93C043*]
	sastivi = sasshivi	27	FL	For common colds, catarrh; int, inf, tea [*91D095*]
Ulmaceae				
Ulmus glabra Hudson	karaağaç	9, 10	RT	For fractured bones; ext, grated root, boiled and condensed to prepare a red-colored ointment and applied to a wrongly repaired fractured bone. It can soften the bone to fix again [*91A180*]
Ulmus minor Miller ssp. *minor*	karaağaç	26	RB	To relax the muscles, for decreasing the swellings and to ease fixing of dislocated bones; ext, boiled [*91D091*]
Umbelliferae				
Coriandrum sativum L.	kişniş	3	FR	For stomachache; int, dec [*91A203*]
Urticaceae				
Urtica dioica L.	dicirgen = ısırgan	9	HB	For rheumatic pain; ext, fresh, cooked with salt, and poultice is applied on legs [*91A176*]
	ısırgan	13	HB	As hypoglycaemic; int, cooked as soup [*91D057*]
		22	HB	For rheumatic pain; ext, poultice [*91D206*]
		23, 28	HB	Against snake bite, swelling in cattle's udders; ext, fresh [*91D133, 91D204*]
	jinčari	27	HB	For rheumatic pain; ext, fresh [*91D093*]
U. pilulifera L.	ısırgan	5	RT	For hemorrhoids; int, dec [*91A147*]
			HB	For hemorrhoids; ext, poultice is prepared from herbs and the patient suffering from hemorrhoids sits directly on the poultice
U. urens L.	dicirgen	7	HB	For rheumatic pain; ext, poultice [*91A160*]
	ısırgan	26	HB	For rheumatic pain; int, dec or poultice, ext [*91D082*]

TABLE 1. CONTINUED.

Plant name	Local name[a]	Locality[b]	Parts[c] used	Use and administration [voucher specimens]
				For hemorrhoids; ext, dec, cooled overnight and used to wash anal fistula
Verbenaceae				
Verbena officinalis L.	kangrenotu	24	HB	As antiseptic for wounds; ext, pounded and applied on wounds, replace every day [*91D156*]
Vitaceae				
Vitis vinifera L.	devek = üzüm çıbığı*	26	ST	For inflammed gum; ext, burned, ash mixed with vinegar is applied on gum [*91D205*]
Animal				
cattle	davar fişkısı*	4	FE	For common colds; ext, dung of cattle obtained in winter is roasted and spread on a bed on which naked patient is laid.
hedgehog	kirpi	8, 14	MT	To treat anal fistula; int, cooked, eaten
turtle	tosbağa	14	BL	To treat anal fistula; int
sheep	koyunderisi*	17	FS	For sunstroke; ext, unclothed patient is covered with the interior part of the fresh skin which is removed from a freshly sacrificed sheep
wildpork	domuz	20	WH	For swelling on hand or anal fistula; ext, the abdominal part is immediately incised after killing the wild pork and hand is inserted inside to treat swelling on hand or the patient sits directly in contact with the incised abdomen to treat anal fistula. When the meat is getting cool it is ineffective

[a] In this column mainly local names of the vegetable or animal drugs are given. If more than one local name is used for the same material, names are separated by (=) symbol. Where a local name is marked with (*), the vernacular name of the used part of vegetable/or animal drug is indicated. For example, "kısılcık ekşısı" is the local name of the concentrated juice of *Cornus mas*, but the plant is called "kızılcık".

[b] Numbers referring to the collection sites of information are given under Figure 1.

[c] Parts used: BL, blood; BU, bulbs; BK, stem barks; BR, branches; FE, feces; FL, flowers; FR, fruits; FS, fresh skin; HB, herbs; IB, interior bark of the stem; LF, leaves; LX, latex; MT, meat; RB, root barks; RE, resin; RT, roots; SD, seeds; SK, stalks; SS, stem sap; ST, styles; TR, tar; WH, whole animal; YS, young shoots.

[d] Application: dec, decoction; ext, externally; inf, infusion; int, internally; +, together with; X, hybrid of; /, or.

[1] Immature fresh fruits.

Results and Discussion

Data obtained from field surveys conducted in the selected sites of the subdivision are summarized in Table 1. Only the plants which could have been identified taxonomically are listed in the table with the Latin name, vernacular name, locality, part used, preparation of remedy and usage under their respective families which are arranged alphabetically. If different vernacular names are given for a plant specimen, data are also classified according to their vernacular names. Those plants that could not be fully identified for lack of botanical elements are not mentioned here, but elsewhere (Tabata et al. 1993).

Of 194 remedies originating from 96 plant species belonging to 41 families and 5 animals, 97 (50%) are recorded here for the first time as Turkish folk medicine (Sezik et al. 1991, 1992; Tabata et al. 1994; Yeşilada et al. 1993a and literature cited in these papers). Furthermore, 78 of 143 vernacular names (54.5%) of medicinal plants in Table 1 are also cited for the first time here.

The largest number of plant species (49 species) are used for the treatment of gastro-intestinal ailments i.e., stomachache, abdominal pain, hemorrhoids, ulcers, and diarrhea. On the other hand, 41 species are used to palliate skin problems such as abscess, wounds, eczema, and swelling. Other common ailments treated with plant remedies are: 34 species for respiratory system affections (cough, bronchitis, common cold, pneumonia), 20 species for inflammatory ailments (rheumatism, erysipelas), 15 species for fever and pains; and 13 species for transmitted diseases (herpes, malaria, tuberculosis, jaundice).

As shown in Table 1, the most widely used medicinal plants in these regions are two subspecies of *Plantago major,* which have been quoted in 12 localities with 10 different vernacular names but for the same utilization. This is followed by *Juglans regia,* which is used in 9 localities with the same vernacular name to palliate rheumatic pain or to alleviate fever in sunstroke or malaria, and by three species of *Urtica* which are used in 8 localities to alleviate rheumatic pain. Members of Coniferae order are also used frequently for the treatment of various disorders: three *Juniperus* species (Cupressaceae) in 9 localities, two Pinus species and one Abies species (Pinaceae) in 11 localities. Rosaceous plants are used frequently as herbal remedies; 11 species from 7 genera are used for various disorders. This is followed in frequency by composites, 10 species from 7 genera.

At a village in Amasya (locality 27) where the ancestors of the inhabitants migrated from Georgia about 100 years ago, we found that not only the vernacular names but also the utilization of some plants was completely different from those in the neighboring villages. If a plant growing in the vicinity was known in Georgia, the plant bore its Georgian name when used for the same purpose as in Georgia. A locally used plant unknown to them in Georgia was called by its Turkish name. For this reason, some utilizations and vernacular names are similar to those reported in our previous paper resulting from our interview with a Georgian old woman practitioner living in a village in the east Black Sea region near the border of Georgia (Sezik et al. 1991). For example, in this village the fresh leaves of *Plantago major* are used externally for the maturation of abscess in inflammatory wounds as it is practised throughout Anatolia, but the dried leaves of the same plant are mixed with honey and taken orally for a unique treatment of gastric ulcers. Interestingly, the same utilization is also observed in the neighboring village (locality 26), but plants were called by a Turkish name. It is known that the leaves of another *Plantago* species, *P. asiatica,* are also used for the treatment of gastric ulcers in Russia (Voitenko, Lipkan, and Maksyutina 1983). In this connection, we recently have demonstrated that an aqueous extract of *Plantago major* leaves shows a significant anti-ulcerogenic activity against a stress ulcer in mice (Yeşilada et al. 1993b).

There are some interesting applications of medicinal plants which are worthwhile to point out here. The roots of *Helleborus orientalis* are used for the treatment of an inflammatory cattle disease called "bohça," which is characterized by swelling in extremities, lack of appetite, and diarrhea. For this purpose, a small nail-shape piece of the root is inserted in a hole opened in the external ear of the animal and kept there until it falls off. During that period it is said a yellow flux drains out from the application site and the disease will be cured. In addition, it is recommended to add some powdered, oven-dried roots to the feed for the cattle as a tonic. In the case of toothache, a small piece of the root is put inside a cavity in the tooth to stop the pain by an anaesthetizing effect. As another example of

interesting utilization, the grated roots of *Ulmus glabra* are boiled and condensed to prepare a red ointment which is applied to a poorly repaired bone fracture to correct it.

The results of this study as well as those obtained from a previous survey in the east Black Sea region (Sezik et al. 1991) suggest a great potential resource of traditional medicine in the western and the middle regions of the Black Sea subdivision. Although western medicine is accessible to the people in these regions to a large extent, many of them still continue to depend, at least in part, on herbal remedies, even though the herbal remedies are being replaced rapidly by modern medicine.

Acknowledgment

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Book Review

Handbook of Arabian Medicinal Plants. Shahina A. Ghazanfar. 1994. CRC Press, Inc. 2000 Corporate Blvd. N. W., Boca Raton, Fl. 33431. 265 pp. (hardcover). $99.95. ISBN 0-8493-0539-X.

Few regions of the world have undergone such sweeping changes as the countries of the Arabian Peninsula. With the development of the oil economy, there has been a shift from the use of traditional remedies, usually based on the local flora, to medicines readily obtainable in pharmacies. Thus, it is critical to document the ethnobotany of the region. This volume does that.

The book is arranged by plant families. A short paragraph introduces the family noting its size, distribution, and chemical compounds of medical interest. This is followed by selected species with local names, description, distribution, phenology, medicinal uses, treatment, chemical composition, comments, and references. Some of these uses are new to me. For example, I was unaware of the use of *Citrullus colocynthis* as a dye. For each plant there are helpful, if sometimes stylized, line drawings. The bibliography is up to date with few errors although titles are lacking, inexplicably, for some entries (e.g., Mansour, Saleh, and Boulos). I was surprised not to see reference to the work by Bebawi and Neugebohrn for northern Sudan. An index of uses for various conditions and diseases is included as well as a general index.

While this book will be a valuable addition to the literature on uses of plants in the region, it lacks a clear focus. There is a brief discussion of traditional medicine, but we are never told how the plants were selected for inclusion nor how the information on local uses was obtained. Perhaps a more accurate title would be "Handbook of Southern Arabian Medicinal Plants" as there are few detailed discussions of uses other than Oman and Yemen.

This is a useful book at a substantial price. The high cost will limit its distribution.

Lytton J Musselman
Old Dominion University
Norfolk, Virginia 23529-0266

TRADITIONAL MEDICINE IN TURKEY VIII. FOLK MEDICINE IN EAST ANATOLIA; ERZURUM, ERZİNCAN, AĞRI, KARS, IĞDIR PROVINCES[1]

EKREM SEZIK,[2] ERDEM YEŞİLADA, MAMORU TABATA, GISHO HONDA, YOSHIHISA TAKAISHI, TETSURO FUJITA, TOSHIHIRO TANAKA, AND YOSHIO TAKEDA

Sezik,[2] **Ekrem** *and* **Erdem Yeşilada** *(Gazi University, Faculty of Pharmacy, Ankara 06330, Turkey),* **Mamoru Tabata, Gisho Honda** *and* **Tetsuro Fujita** *(Kyoto University, Faculty of Pharmaceutical Sciences, Kyoto 606),* **Yoshihisa Takaishi** *(Tokushima University, Faculty of Pharmaceutical Sciences, Tokushima),* **Toshihiro Tanaka** *(Gifu Pharmaceutical University, Gifu),* **Yoshio Takeda** *(Tokushima University, Faculty of Integrated Arts and Sciences, Tokushima, Japan).* TRADITIONAL MEDICINE IN TURKEY VIII. FOLK MEDICINE IN EAST ANATOLIA; ERZURUM, ERZİNCAN, AĞRI, KARS, IĞDIR, ARDAHAN PROVINCES. *Economic Botany 51(3):195–211, 1997. Traditional drugs used in the east Anatolia including Erzurum, Erzincan, Ağrı, Kars, Iğdır, and Ardahan provinces have been surveyed. In this report, 169 remedies obtained from 87 plant species belonging to 38 families and 10 animal species are listed with their vernacular names, parts used, methods of preparing drugs, and traditional usages.*

Türkiye'de Geleneksel Tababet VIII. Doğu Anadolu'da Halk İlaçları: *Doğu Anadolu bölgesinde Erzurum, Erzincan, Ağrı, Kars, Iğdır ve Ardahan illerinin sınırları arasında bulunan köylerde kullanılan halk ilaçları incelenmiştir. Bu çalışmada tespit edilen 38 familyaya ait 87 bitki ve 10 hayvan türünden elde edilen 169 halk ilacı hakkında şu bilgiler tablo halinde verilmiştir; kullanılan materyalin mahalli isimi, Latince tam adı, tedavideki kullanılış amacı, kullanılan kısmı ve ilacın hazırlanış şekli.*

Key Words: traditional medicine; Turkey; east Anatolia; medicinal plants.

East Anatolia is the largest subdivision of Turkey. It is mountainous with severe winters (Tabata et al. 1994). The altitude of mountains increases gradually towards the east and reaches over 1700 m in the plateaus in the north and far eastern regions. Since the whole area is too large to survey at one time, results obtained from two provinces in the south-east part of the subdivision, Van and Bitlis, have been reported previously and the folkloric utilization of plants and animals was compiled (Tabata et al. 1994).

In this study, field surveys were conducted on the northern and north-eastern plateaus of the subdivision in Ağrı, Iğdır, Kars, Ardahan, Erzurum, and Erzincan provinces. These areas have not been investigated for medicinal plant resources, although several studies have been made on those in the neighboring provinces of the subdivision. In these studies mainly ethnobotanical information were reported including some medicinal utilizations of plants in Van, Bitlis, Hakkari, Siirt, Şanlıurfa provinces (n.b.: the latter two provinces are included in another geographical region, south-east Anatolia) (Özçelik et al. 1990), in Elazığ province (Tonbul and Altan 1989), in Munzur Mountains (Tunceli province) (Yıldırımlı 1985, 1994).

METHODOLOGY

Field studies were performed in 30 villages selected from various locations in each province (Fig. 1). The methodology of field survey has been described in previous reports in detail (Sezik et al. 1991 and Fujıta et al. 1995). Voucher specimens, in duplicates, are deposited both in

[1] Received 8 August 1996; accepted 13 February 1997.

[2] Correspondance to: Ekrem Sezik, Gazi Üniversitesi, Eczacılık Fakültesi, Hipodrom 06330, Ankara, Turkey.

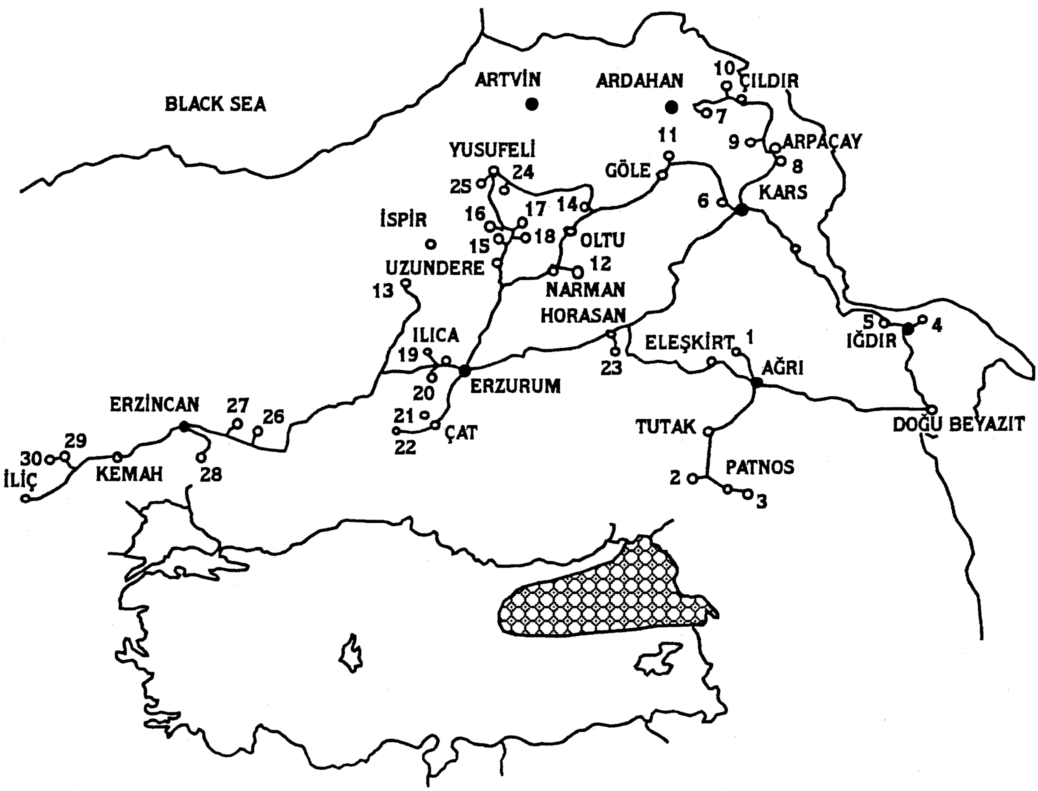

Fig. 1. Map of the survey areas (only the names of the cities and main towns are indicated by names, but villages by numbers). Collection sites of the information are as follows; 1. AĞRI, Eleşkirt, Sarıcan, 2. AĞRI, Tutak, Geçimli, 3. AĞRI, Patnos, Yalçınkaya, 4. IĞDIR, Melekli, 5. IĞDIR, Küllük, 6. KARS, Merkez, Çakmaklı, 7. ARDAHAN, Ölçek, 8. KARS, Arpaçay, Yalınçayır, 9. KARS, Arpaçay, Akmazdam, 10. KARS, Çıldır, Kaşlıkaya, 11. KARS, Göle, Yenidemirkapı, 12. ERZURUM, Narman, Mahmutçavuş, 13. ERZURUM, İspir, Mülk, 14. ERZURUM, Oltu, İriağaç, 15. ERZURUM, Uzundere, Dikyar, 16. ERZURUM, Uzundere, Çamlıyamaç, 17. ERZURUM, Uzundere, Altınçanak, 18. ERZURUM, Uzundere, Sapaca, 19. ERZURUM, Ilıca, Emrecik, 20. ERZURUM, Ilıca, Teprizcik, ERZURUM, Çat, Tuzluca, 22. ERZURUM, Çat, Yavi, 23. ERZURUM, Horasan, Velibaba, 24. ARTVİN, Yusufeli, Morkaya, 25. ARTVİN, Yusufeli, Tekkale, 26. ERZİNCAN, Merkez, Büyükköy, 27. ERZİNCAN, Merkez, Bayırbağ, 28. ERZİNCAN, Merkez, Tatlısu, 29. ERZİNCAN, Kemah, Çiğdemli, 30. ERZİNCAN, İliç, Sularbaşı.

the Herbarium of Faculty of Pharmacy, Gazi University and in the Herbarium of Medicinal Plant Garden, Kyoto University. Taxonomic determinations were done by Sezik, Yeşilada and Honda (co-authors), using the serial "Flora of Turkey and the East Aegean Islands" (Davis, 1965–1984) and related books and publications as well as by comparing with the specimens in the herbarias.

Results and Discussion

Results obtained from field surveys are summarized in Table 1. Plants used as remedies are given under their corresponding families, arranged alphabetically. Data for each species are presented in the following order: Latin name, local name, locality, part used, application and utilization, and the collection number of voucher specimen. Where a plant is known by with different vernacular names, information is given according to the vernacular names as well. Plants which could not be identified fully are not included in Table 1.

Of a total of 169 remedies obtained from 87 plant species belonging to 38 families and 10 animal species, 70.5% of the remedies have not been described in previous reports on traditional medicine in Turkey (Fujita et al. 1995; Sezik et al. 1991, 1992; Tabata et al. 1994; Yeşilada et al. 1993, 1995 and references therein). Further-

TABLE 1. FOLK REMEDIES IN EAST ANOTALIA; ERZURUM, ERZİNCAN, KARS, ARDAHAN, AĞRI, IĞDIR PROVINCES.

Species	Local name[a]	Locality[b]	Parts used	Use and administration[c] [Voucher specimen]
FUNGI				
Langermannia sp.	yaban mantarı	7	whole plant	To stop bleedings; ext, dried, powdered [90E231]
ASCLEPIADACEAE				
Cynanchum acutum L. ssp. *acutum*	sütlüsarmaşık	28	leaf	To drain the pus out of a wound; ext [91E114]
ASTERACEAE				
Achillea albana Stev.	kılıçotu	7	herb	For rheumatic pain; ext, pounded herbs are applied and kept on legs for a while, to drain out the yellow fluid [90E167]
Achillea biebersteinii Afan.	kılıçotu	6	herb	For maturation of abscess; ext, pounded [90E152]
		29	herb	For wound healing; ext, pounded [91E145]
	sarılıkotu	8	herb	Against jaundice; int, boiled [90E011]
Achillea millefolium L. ssp. millefolium	kılıçotu	29	herb	For wound healing; ext, pounded [91E145]
Achillea schischkinii Sosn.	kılıçotu	2	flower	For flatulence; int, powdered, ½ teaspoon is taken [90E090]
Anthemis pseudocotula Boiss.	papatya	5	flower	For stomachache; int, inf, tea [90E128]
Arctium minus (Hill.) Bernh. ssp. *minus*	löşlek	16, 18	leaf	For sunstroke; ext, yoghurt is applied on naked body and then covered with the broad fresh leaves of the plant for overnight [93D032]
Arctium minus Bernh. ssp. *pubens* Arenes	düvetabanı	11	leaf	For an inflammatory animal disease on legs; ext, dec [91E049]
Artemisia austriaca Jacq.	yavşan	11	herb	As mosquito- or flea-repellent; either fresh or dried herbs are used; they hang the plant on their belts to keep the mosquitos away, or put the herbs under bed at home to get rid of fleas [91E053]
		14	herb	Against abdominal pain, internal pains; int, dec [91E064]
Centaurea balsamita Lam.	kılıçotu	11	leaf	For maturation of abscess; ext [91E048]
Centaurea iberica Trev.	çakırdikeni	29	leaf	For wound healing; ext, pounded [91E149]
Centaurea pterocaula Trautv.	çoruşbozan	21	leaf	For wound healing; ext, pounded [90E042]
Helichrysum plicatum D.C. ssp. *polyphyllum*	kaymak çiçeği	7	flower	For diarrhoea and intestinal diseases; int, dec, 1 glass daily for 2–3 days is taken [90E170]
Circium sp.	kilindor	3	root	For hemorrhoids, and internal diseases; int, dec [90E099]
	çakırdikeni =kavruhan	20	stem	For cough, bronchitis; int, fresh plant [90E010]

TABLE 1. CONTINUED.

Species	Local name[a]	Locality[b]	Parts used	Use and administration [c] [Voucher specimen]
Scorzonera tomentosa L.	pinar	26	latex	For wound healing; ext, +butter [91E093]
	nalbant	27	latex, root	For wound healing; ext, +butter [91E093]
Tanacetum argyrophyllum (C. Koch) Tvzel. var. *argyrophyllum*	yavşan	10	herb	For scabies; ext, herbs are burnt and ash is mixed with sulfur, gunpowder and butter to prepare an ointment. 1 or 2 applications is said to be enough for treatment [91E042]
Tanacetum balsamita L.	kılıçotu	9	leaf	For wound healing; ext, fresh [91E028]
	bağa yaprağı	9	leaf	For maturation of abscess; ext, fresh
Tripleurospermum monticolum (Boiss. & Huet.) Bornm.	papatya	23	flower	For stomachache; int, inf, tea [90E066]
Tragopogon buphtalmoides (D.C) Boiss. var. *buphtalmoides*	yemlik	6	leaf	As stomachic; int, fresh [90E148]
		8	latex	For warts; ext [91E212]
BERBERIDACEAE				
Berberis vulgaris L. × *B. crataegina* D.C.	kızambuk	12	root	For jaundice in animals; int, by licking [90E215]
		14, 16, 17	root	For jaundice in man; int, by licking [93D036]
BETULACEAE				
Coryllus avellana L.	findık	2	seed	For treating female infertility; int, the dried meat of a trout (bone should be separated before drying) is pounded with a mixture of two walnuts, one hazelnut, resin of pine tree, and tail at of a male sheep (as a main ingredient) to prepare a vaginal suppository. Six of this drug are inserted into the vagina every evening on the second day after the end of a menstrual cycle. During the treatment, a glass of the decoction of licorice roots should be taken as well [90E234]
BORAGINACEAE				
Alkanna megacarpa D.C.	havaciva	29	root bark	For wound healing, for burns; ext, root barks are peeled and cooked in a pan with the grated wood of *Pinus* sp. and butter to prepare an ointment, the wound should be kept open [91E155]
Arnebia densiflora (Nordm.) Ledeb.	havaciva	27	root bark	For wound healing, for burns; ext, same as described for *Alkanna megacarpa* roots [91E127]
Echium russicum J.F. Gmellin	havaciva	7	root	For fissures on hand and wound healing; ext, grated roots are cooked in a pan with butter to prepare a reddish ointment and then applied on skin. It is used for both human and domestic animals i.e. fissures on cow udder [90E165]

TABLE 1. CONTINUED.

Species	Local name[a]	Locality[b]	Parts used	Use and administration [c] [Voucher specimen]
Echium vulgare L.	havaciva	7	root	For fissures on hand and wound healing; ext, same as described for *Echium russicum* [90E184]
Onosma seticeum Willd.	havaciva	20	root bark	For wound healing; ext, red barks of the roots are peeled and cooked in a pan with butter to prepare an ointment and applied on wounds [90E016]
Onosma microcarpum Steven ex D.C.	havaciva	23	root	For burns; ext, butter, beeswax and pine wood are cooked in a pan, then the wood is removed. The remaining mixture is then mixed with grated root of the plant to prepare an ointment and applied on skin [90E064]
CAPRIFOLIACEAE				
Sambucus nigra L.	patırık	30	leaf	For maturation of abscess; ext [91E151]
CARYOPHYLLACEAE				
Silene saxatilis Sims.	simotu	11	herb	For wound healing; ext. pounded [91E045]
CHENOPODIACEAE				
Beta corolliflora L.	kızılca	22	root	For hemorrhoids; int, dec [90E052]
Beta vulgaris L. ssp. *rapa* f. *altissima*	kırmızı pancar	30	tuber	Against constipation; int, cooked with wheat and eaten [91E164]
CORNACEAE				
Cornus mas L.	kızılcık pestili* or kızılcık ekşisi*	15, 17	fruit	For diarrhea; int, fruits are boiled and condensed to a thick paste and then spread on a piece of cloth and dried under sun. The cloth is them removed and dried sheets thus obtained "kızılcık pestili" are kept at home for use in winter, but fresh fruits are also said to be effective, when available, or boiled fruits which are called as "kızılcık ekşisi" can be used instead [91E156]
CRUCIFERAE				
Alyssum pateri Nyar.	Ğulik	3	herb	For wound healing; ext, powdered [90E107]
Brassica oleracea L. var. *capitata*	lahana	19, 21	leaf	Against fever, headache; ext, sliced, applied on forehead [90E239]
		24	leaf	For maturation of abscess; ext [90E245]
CUCURBITACEAE				
Cucurbita pepo L.	kabak, kabak çekirdeği*	14, 27	seed	As anthelmintic; int, one tea glass of seeds is eaten on empty stomach [91E240]

TABLE 1. CONTINUED.

Species	Local name[a]	Locality[b]	Parts used	Use and administration[c] [Voucher specimen]
CUPRESSACEAE				
Juniperus oxycedrus L.	dikenli ardıç	14	fruit + leaf	Against rheumatism; ext, dec, bath [91E244]
	çırtı	15	tar	For parasitic diseases, fractured or dislocated bones; ext, tar is obtained by heating the wood inside a large pottery on an open fire and applied ext on broken or dislocated bones in man or against parasitic diseases in animals [93D008]
	tikenardıçı	15	fruit	For cough (for animals); int, dec [91E241]
	çekem	27	fruit	For cough (for animals); int, dec [91E132]
DIPSACACEAE				
Cephalaria sparsipilosa Matthews	gevrik	13	latex	For cuts and wounds as antiseptic; ext, stem juice [90E242]
ELEAEGNACEAE				
Eleagnus angustifolius L. var. *orientalis* (L.) Kuntze	iğde	14	leaf	For sunstroke; ext, the leaves of *Eleagnus angustifolia* (iğde), *Juglans regia* (ceviz) and *Mentha longifolia* are boiled together and used as a bath, some other plants may be added for a stronger effect [91E237]
EUPHORBIACEAE				
Euphorbia agraria Bieb.	sütotu	7	latex	For wound healing; ext [90E175]
Euphorbia virgata Waldst. & Kit.	sütlücan =sütcan	13	flower	for eczema; ext, flowers are applied on skin by rubbing and then the affected area is washed with a lime solution to treat eczema [90E230]
FUMARIACEAE				
Fumaria microcarpa Boiss. ex F.	şahtere	19	herb	For piles, or for eczema on hand; int, one glass of decoction of flowering herbs is taken every morning on empty stomach for 10 days. Although fresh herbs are more effective, dried herbs are also used for the same purpose in winter [90E002]
Fumaria officinalis L.	nuzla otu	7	herb	For toothaches, wounds on the palate and other oral diseases; dec, gargle [90E169]
	şahtere	21	herb	For toothache; int, dec [90E035]
GRAMINAE				
Hordeum vulgare L.	arpa	4	fruit	Against itching; ext, pounded, boiled, applied as poultice [91E165]
		13	fruit	Against rheumatism; int, pounded, boiled in yoghurt juice [91E171]

TABLE 1. CONTINUED.

Species	Local name[a]	Locality[b]	Parts used	Use and administration [c] [Voucher specimen]
		22	fruit	For dysurea; dec, int [90E244]
		24, 25	fruit	For maturation of abscess; ext, poultice [90E248]
Zea mays L.	cala püskülü	14	style	To pass kidney stone; int, dec, tea [91E170]
	mısır püskülü	25	style	For cough; int, dec, +honey [90E232]
JUGLANDACEAE				
Juglans regia L.	ceviz	2	seed	For treating female infertility; ext, as described for *Coryllus avellana* [91E157]
		14	leaf	For sunstroke; ext, dec, bath, as described for *Eleagnus angustifolia* [91E161]
		18	leaf	For sunstroke; ext, as a bed, the patient's body is covered with fresh leaves [91E175]
		24	leaf	For hemorroids; ext, applied on piles [90E233]
LAMIACEAE				
Mentha longifolia L.	pünk	1	herb	For internal diseases, abdominal pain; int, dec [90E072]
		2	herb	Against menstrual pain; int, inf, tea [90E091]
		3, 26	herb	Against stomachache; int, dec [90E108, 91E099]
	yarpız	6	herb	For cough, bronchitis; int, dec, tea [90E149]
				For headache; inhale the vapors of hot dec
		21	herb	For stomachache, hemorrhoids; int, dec [90E037]
	yarpuz	14	herb	For sunstroke; ext, dec, bath, as described for *Eleagnus angustifolia* [91E214]
Salvia nemorosa L.	gemdaş =gemtaş	16, 18, 24	herb	To stop bleeding, wounds; ext, pounded and applied on wounds [93D033, 91E076]
Teucrium polium L.	merven	2	herb	For diarrhoea, hemorrhoids; int, dec [91E158]
	merven	3	herb	For internal diseases; int, dec [90E101]
	—	27	herb	To stop bleeding; ext, pounded [91E131]
LEGUMINOSAE				
Glycyrrhiza glabra L.	tatlı biran	28	root	For cough, bronchitis; int, dec [91E175]
	payam	29	root	As stomachic; int, dec [91E146]
	süs	2	root	For cough, diarrhoea; int, dec
Lathyrus sativus L.	çüşne	19	seed	To stop pain in fractured bones or injuries; ext, pounded, +water to obtain a dough [90E247]
Onopodrum bracteatum Boiss. et Heldr.	kangal=kobuk	8	seed	Against hemorrhoids; int, milled seeds are mixed with pure honey (with honeycomb) and one teaspoonful is taken every morning and evening on an empty stomach [91E012]

TABLE 1. CONTINUED.

Species	Local name[a]	Locality[b]	Parts used	Use and administration [c] [Voucher specimen]
Trifolium pratense L. var. *pratense*	üçkulak	25	leaf	For wound healing; ext [91E072]
LILIACEAE				
Allium cepa L.	soğan	4	bulb	For bee stings; ext, cut in halves [90E251]
		19	bulb	For fractured bones; ext, grated bulbs are mixed with albumen, pine tar (karasakız), and grated soap to obtain an homogeneous mixture and applied ext on a fractured bone after fixing [90E248]
		22	bulb	For wounds; ext, sliced, cooked [91E168]
		17	bulb	For maturation of abscess; ext, cooked in ashes [90E260]
		23, 24	bulb	For maturation of abscess; ext, grated, boiled with milk [91E159]
		25	bulb	Against sprains; ext, pounded with salt [91E177]
MALVACEAE				
Althea cannabina L.	şahmehlemi	5	root	For calcinosis; ext, pounded, boiled, +flour [90E127]
Malva neglecta Wallr.	dolik	1	herb	For abdominal pain; int, dec [91E166]
				To protect wounds from infection; ext, poultice
		2	herb	For peptic ulcer; int, herbs are dried under shade and powdered, mixed with white alum and a yellow root (they don't remember the name) sold by akhtar (herb dealer). One teaspoonful of this mixture is taken before every meal [90E095]
		3	herb	For maturation of abscess; ext, pounded herbs are boiled in buttermilk and then flour is added to prepare a thick poultice and applied ext. on abscess [90E109]
	tolik =ebemkümeci	23	herb	For common colds; ext, dec, bath [90E069]
	emeçkümeci	6	leaf	For wound healing; ext, fresh [90E155]
	=ebemkümeci		leaf	To treat infertility (for women); ext, leaves are boiled together with the roots of karakuşburnu (*Roda canina* L.) and flowers of sandal (an Asteraceae plant which could not be supplied) and the extract used as tea as well as a bath for curing infertility in women
			herb	For maturation of abscess; ext, pounded with flour, +butter
	ebemkömeci	19	herb	For stomachache; int, dec [90E001]

TABLE 1. CONTINUED.

Species	Local name[a]	Locality[b]	Parts used	Use and administration [c] [Voucher specimen]
	ebemgümeci	5	herb	For maturation of abscess; ext, poultice, herbs are boiled to prepare a poultice and mixed with a poultice prepared from the root barks of *Ulmus carpinifolia* and applied ext on abscess for overnight to drain the inflammation out [90E124]
	ebegümeci	9	herb	For maturation of abscess; ext, herbs are boiled in milk and then mixed with 1 tablespoonful of flour to obtain a poultice [91E029]
	ebemkövenci	11	herb	For wounds; ext, poultice applied on wounds [91E056]
				For bronchitis; ext, poultice applied on neck
				For indigestion; int, poultice
	korkut =emeküimeci	7	herb	For abdominal pain, constipation, sore throat; ext, pounded herbs are cooked in a pan with barley flour, and applied on abdomen to alleviate abdominal pain and constipation, or on the neck for sore throat [90E177]
	berberu	26	herb	For common colds, infertility, women diseases; int, dec, bath [91E098]
MORACEAE				
Ficus carica L.	kuru incir*	1	fruit	For inflammed breast; ext, dried, moistened [91E187] ext, for 3–4 days
		2	fruit	For diarrhoea; int, with milk [91E184]
Morus alba L.	dut pekmezi*	15, 18	fruit	For maturation of abscess; ext, fruits are boiled and condensed to a thick syrup form and applied [90E255]
				For stomach disorders; int, boiled and condensed fruits
	dut pestili*	15, 18	fruit	For maturation of abscess; ext, boiled and condensed fruits are mixed with flour and spread on a piece of cloth, then dried under sun to obtain sheet-like layers. This product is kept at home to use either as medicine or food
	tut pestili*	17	fruit	For maturation of abscess; ext, boiled and condensed fruits [90E252]
				For stomach disorders; int, boiled and condensed fruits

TABLE 1. CONTINUED.

Species	Local name[a]	Locality[b]	Parts used	Use and administration [c] [Voucher specimen]
	beyazdut	29	fruit	For gastric ulcers, stomachic disorders; int, fruits are boiled with sugar and condensed. One tablespoonful of this extract is taken orally every morning on an empty stomach [91E174]
OLEACEAE				
Olea europea L.	karazeytin	19	fruit	For sprains to palliate pain and decrease swelling; ext, pounded black olive and grated apple fruits are mixed with the lung of a cow or a sheep to obtain an homogenous cake and applied ext on sprains [91E186]
	zeytin	24	leaf	For hemorrhoids; int, the first extract of the leaves which obtained by boiling for a short time is discarded and then a second extract is prepared and used orally [91E190]
PINACEAE				
Abies nordmaniana (Stev.) Spach.	köknar pisi* =ladin pisi*	24, 25	tar	For wound healing, maturation of abscess; ext [91E189]
Pinus sylvestris L.	sarıçam	14	tar	For wound healing; ext, +butter [90E256]
	sarıçam katranı =karasakız	25	tar	For snake bite; ext, +egg yolk [91E178]
	çam soymuğu*	24	stem sap[2]	As panacea, for tuberculosis; int [90E235]
PLANTAGINACEAE				
Plantago major L. ssp. *intermedia*	belhavz	3	leaf	For maturation of abscess; ext, fresh [90E098]
	katırtırnağı	27	leaf	For maturation of abscess; ext, fresh, smeared with butter [91E117]
Plantago major L. ssp. *major*	bağa yaprağı	5, 7, 11, 12, 14, 15, 17	leaf	For maturation of abscess; ext, fresh [90E125; 90E168] [91E052; 93D009] [93D043]
		10	leaf	For wounds and rashes on the body; ext, dec, bath [90E208] For hemorrhoids; int, dec
	boğa yaprağı	16	leaf	For maturation of abscess; ext, fresh [93D031]
	belhavz	8	leaf	For maturation of abscess; ext, fresh [91E010]
	supazısı	24	leaf	For maturation of abscess; ext, fresh [91E215]
	sinirliot	25	leaf	For maturation of abscess; ext, fresh [91E071]
	siğilotu	29	leaf	For maturation of abscess; ext, fresh [91E147]
	amin	26	leaf	For maturation of abscess; ext, fresh, smeared with butter [91E095]

TABLE 1. CONTINUED.

Species	Local name[a]	Locality[b]	Parts used	Use and administration [c] [Voucher specimen]
		6	leaf	For erysipelas, inflammated or infected wounds; ext, fresh [90E151]
				For stomachache; int
POLYGONACEAE				
Polygonum cognatum Meissn.	ebemkümeci	22	herb	For maturation of abscess; ext, dec, +flour [90E051]
RANUNCULACEAE				
Clematis orientalis L.	muşurbazotu	17	herb	Against rheumatism; ext, pounded herbs are put inside an empty pericarp of walnut and applied on legs for 24 h. Should not be applied on joints [93D042]
	mısırbazotu	18	herb	For maturation of abscess; ext
Ranunculus neopolitanus Ten.	mayıs çiçeği =sarıçiçek	9, 10, 11	flower	To reduce inflammation on rheumatism; ext, pounded [91E014; 91E050]
Ranunculus repens L.	mayıs çiçeği	20	herb	For rheumatism, edema; ext, pounded herbs are applied on legs for max. 1 h to drain the edema out [90E005]
Ranunculus sericeus Banks & Sol.	şelepuk	2	whole plant	To reduce inflammation in rheumatism; ext, pounded [90E093]
Thalictrum minus L. var. *minus*	karakatranotu	1	herb	For maturation of abscess; ext, poultice+flour [90E078]
ROSACEAE				
Cydonia oblonga Miller ayva		4	leaf	For diarrhoea; int, dec [91E185]
Rosa canina L.	şilan	1, 7, 12, 13	fruit, root	For hemorrhoids; int, dec, tea [90E075, 90E187, 90E207, 90E243]
		2	root, leaf, or flower	For cough, bronchis; int, inf, tea [90E179]
	karakuşburnu	6	fruit, root	For hemorrhoids; dec is drunken as tea as well as used as a bath inside, or applied ext on fistula while it is hot [91E160]
		14	fruit	For hemorrhoids; int, cooked, mashed [91E214]
	kuşburnu	19, 22, 10	root	For hemorrhoids; int, dec [90E004]
		20	fruit	For hemorrhoids; int, dried fruits are boiled and pulps are removed by sieving. The extract is then concentrated by boiling on fire. One glass of this condensed extract is taken every day for 3–4 days [90E241]
		11	fruit, root	For hemorrhoids, cough; int, dec [91E051]
	karadiken	8	root	For hemorrhoids; int, dec [91E210]

TABLE 1. CONTINUED.

Species	Local name[a]	Locality[b]	Parts used	Use and administration[c] [Voucher specimen]
			fruit	For hemorrhoids; int, eaten
Rubus hirtus Waldst, & Kit.	piçüzümü =yabanüzümü	27	root	Against diabetes; int, dec [91E125]
Rubus idaeus L.	tiri-irazi	1	aerial parts	For curing sterility; int, aerial parts are boiled and put inside a jug made of zinc. This extract is drunk every morning and evening on an empty stomach for 1–2 months for curing sterility. It is effective for both man and woman who want children [90E079]
Sorbus domestica L.	hurma=üvez	24	leaf	As desiccant in burns; ext, ash, sieved [91E073]
	hurma	25	leaf	For cough; int, dec [93D002]
			fruit	For diarrhea; int, eaten
RUTACEAE				
Citrus limonum Risso	limon	1	fruit	Against high fever (for children); est, juice, on body [91E176]
SALICACEAE				
Populus nigra L.	kavak= kavak, çürüğü*	29	rotten wood	To stop bleeding; ext, powdered [90E249]
SOLANACEAE				
Hyoscyamus niger L.	batbat	14	seed	Against itching in the eyes; ext, seeds are spread on dying embers and eyes are exposed to fume to treat itching in the eyes caused by worms [90E250]
		17, 19	seed	Against toothaches; ext, seeds are spread on dying embers and smoke inhaled through mouth. Small white worms with black head are dropped inside a cup of water on fire[3] [93D044, 90E003]
	batbata	8	seed	Against toothaches; ext, same as described above [91E009]
	batbatı	20	seed	Against toothaches; ext, same as described above [90E006]
	şakşaku	27	seed	Against toothaches; ext, same as described above
Solarnum tuberosum L.	patates	19, 20, 21	tuber	For fever and headache; ext, slices, applied on forehead
TYPHACEAE				
Typha latifolia L.	—	29	flower	To stop bleedings; ext, [90E238]
ULMACEAE				
Ulmus carpinifolia Gleditsch.	karaağaç	5	root bark	For maturation of abscess; ext, poultice, mixed with the poultice prepared from *Malva* sp. herbs and applied on abscess for overnight [90E129]

TABLE 1. CONTINUED.

Species	Local name[a]	Locality[b]	Parts used	Use and administration [c] [Voucher specimen]
UMBELLIFERAE				
Eryngium bilardieri Delar.	gelenk	1	root	For maturation of abscess; ext, pounded, boiled with flour, poultice applied [90E076]
	boğadikeni	22	root	For maturation of abscess; ext, pounded, boiled with flour, poultice applied [90E049]
URTICACEAE				
Urtica dioica L.	ısırgan	6, 9, 12, 15, 16, 17, 28	herb	Against rheumatism and rheumatic pain; ext, fresh [90E158, 90E209, 93D011, 93D038, 91E121]
		20		Against rheumatism, rheumatic pain; ext, poultice [90E009]
		22		For stomachache; int, a poultice is prepared and eaten [90E058]
		6, 22		For cough, colds; int, dec, int [90E158]
	ğijirtken =isirgan	11		Against rheumatism; int, dec [91E059]
	çinçar	7		Against rheumatism; ext, fresh [90E174]
	dırık	26		Against rheumatism; ext, fresh [91E097]
Urtica haussknechtii Boiss.	ısırgan	27	herb	Against rheumatism, swellings in legs; ext, fresh [91E115]
Urtica pilulifera L.	gezgezk	1, 2	herb	For abdominal pain, internal diseases; int, dec [90E070]
		2, 3		For rheumatic pain; ext, fresh or dec, int [90E253]
Urtica urens L.	çinçar	7	herb	Against rheumatism; ext, fresh [90E179] it is said to be more effective than *U. dioica.*
ZYGOPHYLLACEAE				
Peganum harmala L.	üzerlik	14	seed	For stomachache; int, pounded with honey [91E065]
Tribulus terrestris L.	dadaşotu	28	herb	For diarrhea; int, dec [91E113]
ANIMAL				
bear (fat)	ayı yağı*	8	fat	Against hemorrhoids; int, melted fat is absorbed on crumbled bread and eaten. In spite of the nasty taste, it is said to be very effective
cow (lungs)	davar akciğeri*	23	lung	For erysipelas; ext, first alum is spread on the inflammated part, then fresh whole lung is applied for overnight to reduce the inflammation
		19	lung	For sprains; ext, pounded black olive and grated apple are mixed with the lung to obtain an homogenous cake and applied ext on sprains

TABLE 1. CONTINUED.

Species	Local name[a]	Locality[b]	Parts used	Use and administration [c] [Voucher specimen]
leech	sulutkan	5	whole	Against rheumatism; ext, applied on joints
rabbit	tavşan gıgısı*	19	feces	For maturation of abscess; ext
slug	şeytanuk	1, 2	whole	For abscess or gangrenous wounds, for wound healing; ext, pounded with green alum, applied
sheep	karaciğer*	1	liver	For gangrenous wounds; ext, a tourniquet is applied to either arm or leg which is then incised with a razor to drain blood. After that, the inner side of a fresh skin just removed from a freshly sacrificed sheep is applied for half a day. Then a poultice prepared from the herbs of *Malva* sp. is applied on the wound to protect from infection. Instead of fresh skin, fresh liver or fresh paunch, without washing, can be used.
		29	liver	Against jaundice; int, a gland found in the liver is mixed with honey and swallowed. It is said to be very effective
	taze deri*	1	fresh skin	For gangrenous wounds; ext, used as described for liver
		8	fresh skin	For bruises, hematoma; ext
	işkembe*	1	paunch	For gangrenous wounds; ext, used as described for liver
				For snake bite; ext, the poison is first drained out by incising the affected part with a razor and then yoghurt is smeared, followed by the application of a washed paunch of sheep
	koyun kuyruğu*	8	tail fat	For bruises and hematoma; ext
	kirliyün*	19	crude wool	Against pain; ext, applied on joints
snail	sümüklüböcek	25	whole	For snakebite; ext, living snail is put on the bitten site. When the snail sucking the poison falls down, it has to be replaced with a new snail
snake	yılankılıfı*	17	skin	For erysipelas; int, eaten with breas as a sandwich
		4		For hemorrhoids; ext, mixed with a plant (not collected) and prepared as an ointment, applied on fistulas
spider	örümcek ağı*	20	cobweb	To stop bleeding; ext, applied on cuts

TABLE 1. CONTINUED.

Species	Local name[a]	Locality[b]	Parts used	Use and administration [c] [Voucher specimen]
trout	alabalik	2	whole	For treating female infertility (see *Coryllus avellana*). To fix broken bones; ext, trout is cut into two pieces and applied on wrongly fixed fractured bone to loosen the bone, so that they may easily be separated and then fixed correctly again. Albumen is mixed with grated raw soap to use as an ointment which is then applied to the repaired bone which is fixed with 2–3 pieces of wood
	kizilalabalik	5	whole	To fix broken bones; ext, as described above

[1] Broad basal leaves of the plant are called as "bağa yaprağı" and applied on abscess for maturation and to protect wounds from infection. The basal leaves resembled that of *Plantago* spec. which is commonly known as "Bağa yaprağı" and used for the same purpose, so probably a misutilization is in question in this village.

[2] A juice obtained after peeling the bark of stem is called "çam soymuğu".

[3] For details see Tabata et al., 1993.

[a] In this column mainly local names of the vegetable/or animal drugs are given. If more than one local name is used for the same material, names are separated by (=) symbol. Where a local name is marked with (*), the vernacular name of the used part of vegetable/or animal drug is indicated.

[b] Numbers referring to the collection sites of information are given under Fig 1.

[c] Application: dec, decoction; ext, externally; inf, infusion; int, internally, +, together with; X, hybrid of; /, or.

more, 59.1% of the vernacular names in Table 1 are recorded for the first time.

The most frequently used folk remedies are those against skin problems including wounds, abscess, eczema, bleeding etc. (38.2% of all remedies). 21.2% of the remedies are used for the treatment of gastro-intestinal disorders including stomachache, peptic ulcers, diarrhea, hemorrhoids, and 8.2% of the remedies are used for the treatment of respiratory ailments such as common cold, cough and bronchitis. This pattern is similar to that observed in the neighboring provinces of this subdivision (Tabata et al. 1994). However, when compared to the Mediteranean subdivision where many herbal remedies are used against urinary troubles (i.e., kidney stone and dysuria) (Yeşilada et al. 1993, 1995), we recorded only two remedies (1.0% of all remedies) in our present study. This may suggest a low occurence of urinary problems in the eastern areas of Anatolia.

Some plants listed in Table 1 have been recorded for the same purpose, such as two subspecies of *Plantago major* both used for the maturation of abscess (in 17 localities, 56.6% of the sites surveyed), and *Urtica* sp. for the treatment of rheumatism either by applying directly on the affected part to relieve pain or by drinking the decoction (used in 16 localities, 53.3% of the sites surveyed).

Species of the Asteraceae family are used frequently as herbal remedies (18 species belonging to 11 genera). Four different species of *Achillea* are called by the same vernacular name "kılıçotu" in different localities, but are used for different purposes. In contrast, two species, *Centaurea balsamita* and *Tanacetum balsamita,* also called as "kılıçotu," are used for similar purposes. On the other hand, roots of five different boraginaceous plants, with the same vernacular name, are used for the same purpose. It is also recorded that people commonly use a mixture of herbs called "tırpan kiri" (dirt of scythe), which is collected from the tip of a scythe, to stop bleeding when they cut their fingers during harvesting.

It should be noted that folk medicines of animal origin (15 remedies from 10 animals) are more frequently used in these eastern areas than in other regions of Turkey. As an interesting example, a slice of trout "alabalık" is said to be applied on a wrongly fixed bone fracture and kept for one day to fix the bone again correctly.

A similar practice as well as the treatment of calcinosis is reported for other parts of Anatolia, (Tabata et al. 1993).

As it is observed commonly in other subdivisions of Turkey, inhabitants of this subdivision also use simple prescriptions with only one or two ingredients. However, traditional practitioners and herbalists sometimes use more complex formulae. Information obtained directly from the former during the present field trip is included in Table 1, as their method of medical treatment can be regarded as a traditional therapy. In Ağrı, (location 1), we interviewed a female traditional healer who is said to be an expert in the treatment of gangrenous wounds. This information is inherited from her mother. For this treatment, she ties a tourniquet on the upper part of the affected extremity then incises the wound to drain the dirty blood out. She then applies paunch (stomach or derma) which is removed from a freshly sacrificed sheep tightly on the wound and kept overnight. After removing the paunch, a poultice prepared from *Malva neglecta* is applied for protection of the wound. For rapid recovery of gangrenous wounds, as well as other wounds, pounded snail is applied on the wound. For the treatment of any internal disease that could not been diagnosed, she uses a concoction of several herbs: Pünk (*Mentha longifolia*), tirşu (*Rumex* sp.), belhavz (*Plantago major*), gezgezk (*Urtica pilulifera*), gelenkotu (*Eryngium bilardieri*) are boiled in a large container, and the patient takes a bath in this extract. This treatment is repeated for a few days. As a supplementary treatment, tea prepared from a concoction of pünk, belhavz, dölik (*Malva neglecta*) and gezgezk is taken.

In Location 3, we interviewed a male traditional practitioner in his house. In addition to remedies obtained from local plants, he also prepares some mixtures of drugs obtained from Akhtars (herbalists). As an example, the following prescription is said to be effective against hemorrhoids, jaundice, bronchitis and used as a panacea for any kind of internal diseases. [Latin names of the crude drugs in this recipe are given as refered by book of Başer, Honda and Miki (1986)]: ketehindi [*Acacia catechu*], zencefil [*Zingiber officinale*], dar-ül fül fül [*Piper longum*], karanfil [*Eugenia caryophyllata*], nar [*Punica granatum*], beyazkök [?], yel cevizi [?], beyaz şap [white alum], yeşil şap [green alum], limontuzu [citric acid]. All the materials are mixed and boiled with pomegranate juice and condensed over the fire to one glass. One teaspoonful of the extract is taken on an empty stomach. This causes vomiting 15 min after administration, but the patient will feel better. The powdered mixture prepared without addition of pomegranate juice is blown into the throat through a reed to treat throat cancer or wounds in the mouth.

In Doğu Bayazıt, Karabulak Village (Ağrı province), a famous herbalist who was educated in Cairo and employes Islamic medicine told us the following Turkish names of crude drugs which he purchases from local Akthars. [Latin names of these plants are tentatively given according to Başer, Honda and Miki (1986)]. Since the purpose of this study is limited to folk medicine applied by people and traditional practitioners, the information obtained in this interview is not been included in Table 1.

Crude Drugs

Adaçayı [*Salvia triloba* (Lamiaceae)], herbs, infusion, as sudorific, against amenorrhea, to treat oligospermia.

A concoction of anason [*Pimpinella anisum* (Umbelliferae)], fruits, and sinameki [*Cassia angustifolia* (Leguminosae)], leaves, decoction, used as a laxative.

Biberiye [*Rosmarinus officinalis* (Lamiaceae)], leaves, infusion, against headache, used as a sedative.

Ceviz [*Juglans regia* (Juglandaceae)], leaves, decoction, to purify blood, for the treatment of leukemia.

Çoban çantası [*Capsella bursa-pastoris* (Cruciferae)], herbs, for treating kidney ailments.

Hatmi [*Althea officinalis* (Malvaceae)], flowers, decoction, against amenorrhea, stomach ache, as gargle for bronchitis.

Havacıva [*Alkanna tinctoria* (Boraginaceae)], root bark, ointment, for wound healing.

Isırgan [*Urtica dioica* (Urticaceae)], herbs, decoction, for treating eczema, pruritus, stomach disorders.

Kantaryon [*Erythraea centaurium,* (Gentianaceae)], flowers, infusion, used as a tonic, against diarrhea, and as a sedative.

Karabaşotu [*Lavandula stoechas* (Lamiaceae)], herb, infusion, used against epilepsy, insomnia, cancer, arteriosclerosis.

Kişniş [*Coriandrum sativum* (Umbelliferae)],

fruits, against headache, used as a sedative, as an abortifacient, and for pimples.

Mürver [*Sambucus nigra* (Caprifoliaceae)], flowers, infusion, used for diabetes.

Oğulotu [*Melissa officinalis* (Lamiaceae)], herbs, infusion, used for stomach and cardiac disorders.

Ökaliptus [*Eucalypthus camaldulensis* (Myrtaceae)], leaves, decoction, for treating sinusitis, bronchitis, toothache.

Ökseotu [*Viscum album* (Loranthaceae)], herb, decoction, for treating jaundice, hepatoprotective.

Papatya [*Matricaria chamomilla* (Asteraceae)], flowers, decoction, for the treatment of gastrointestinal affections.

Reyhan [*Ocimum basilicum* (Lamiaceae)], herb, infusion, used for headache and as an appetizer.

Rezzaniye [*Foeniculum vulgare* (Umbelliferae)], fruits, infusion, used against amenorhhea, furuncles.

Şahtere [*Fumaria officinalis* (Fumariaceae)], herb, decoction, used to dilute blood, as an antimicrobial, for stomach ailments and arteriosclerosis.

Üvez [*Sorbus domestica* (Rosaceae)], leaves, decoction, used for diabetes.

Yavşan [*Artemisia* spec. (Asteraceae)], herb, decoction, used to treat migraine.

Conclusion

Although traditional medicine is still widely practised throughout the region, it is being rapidly replaced by modern medicine and pharmaceuticals. Furthermore, owing to the migration of rural people from villages to large cities in recent years, particularly to Istanbul, knowledge of traditional therapy is being lost rapidly. In Erzincan, Ardahan, and Kars provinces, this problem is especially evident. For the sake of preserving traditional medicinal knowledge, immediate action must be taken to record folk knowledge of traditional medicine and therapy before it disappears completely from Turkey.

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